ATTACHMENT 2

WASTE ANALYSIS PLAN

Last Revised January 2, 2004

Supporting Documentation is located in Attachment 3.

TABLE OF CONTENTS

TOCDF WASTE ANALYSIS PLAN - BODY

LIST OF ACRONYMS

Acronym	Definition
ACS	Agent Collection System
AQS	Agent Quantification System
BRA	Brine Reduction Area
Btu	British Thermal Unit
CAL	Chemical Assessment Laboratory
CTC	Cutaway Ton Container
DFS	Deactivation Furnace System
DUN	Dunnage Incinerator, dunnage
DSHW	Division of Solid and Hazardous Waste
ECR	Explosive Containment Room
EPA	Environmental Protection Agency
GB	Sarin, Isopropyl methylphosphonofluoridate
GC/MS	Gas Chromatography/mass spectrometry
H/HD/HT	Sulfur Mustard[1]/Distilled Sulfur Mustard/Distilled Mustard with 40% Chloroethylthoethylester
HDC	Heated Discharge Conveyor
HEPA	High Efficiency Particulate Air
HRA	Hazard Risk Assessment
JACADS	Johnston Atoll Chemical Agent Disposal System
LIC	Liquid Incinerator
MDB	Munition Demilitarization Building
MPF	Metal Parts Furnace
MSB	Monitor Support Building
ONC	On-site Container
PAS	Pollution Abatement System
PCB	Polychlorinated Biphenyl Compounds
Ppb	Parts per billion
Ppm	Parts per million
RCRA	Resource Conservation and Recovery Act
RHA	Residual Handling Area
Subtitle C TSDF	Hazardous Waste Treatment, Storage and Disposal Facility
TC	Ton Container
TCA	Tooele Chemical Activity
TCLP	Toxic Characteristic Leaching Procedure
TMA	Toxic Maintenance Area
TOCDF	Tooele Chemical Agent Disposal Facility
TSCA	Toxic Substance Control Act
TSDF	Treatment, Storage and Disposal Facility
UPA	Unpack Area
VX	O-ethyl-S(2-diisopropylaminoethyl) methyl phosphonothiolate

Notes: 1 Sulfur Mustard = Bis(2-Chloroethyl) Sulfide or 2.2' Dichlorodiethyl Sulfide

TOOELE CHEMICAL AGENT DISPOSAL FACILITY
WASTE ANALYSIS PLAN

2.1 INTRODUCTION

2.1.1 Generators of hazardous waste are required to obtain detailed chemical analyses of wastes they intend to treat, store, or dispose of in order to ensure proper hazardous waste management practices.

2.1.2 This Waste Analysis Plan describes:

(1) The physical and chemical analyses the TOCDF will perform before hazardous wastes are stored, treated, or transported off-site for further treatment and ultimate disposal,

(2) The methods to be used to collect samples,

(3) The frequency of sampling/analysis,

(4) The methods to be used to analyze the samples

(5) The procedures that will be used to ensure the validity of the analytical results, and

(6) The basis for generator knowledge

2.2 PARAMETERS AND RATIONALE 40 CFR 264.13(b)(1) [R315-8-2.4]

Tables 2-0 and 2-1 presents a summary of this entire waste analysis plan. For each waste stream specified, these tables present the selected analytical parameters and corresponding analytical methods, sampling frequencies, and sampling methods. In addition the tables includes either a reference to the unit that will treat each waste stream (for waste to be treated on-site) or a reference to the process generating each waste stream (for wastes to be treated and disposed of off-site).

2.2.1 Analyses for Wastes Requiring On-Site Treatment

2.2.1.1 Waste streams included in this section will be treated on-site in one or more of the five incinerators, or the Brine Reduction Area. Analytical parameters were selected for each waste stream based on previous analytical results obtained for similar waste streams, the homogeneity of the waste and the ability to obtain a representative sample, and/or government manufacturing specifications (in regards to munition energetic components).

2.2.1.2 For wastes to be treated on-site, which are not included in Table 2-0, the DSHW will be notified to determine the most appropriate management practices (i.e., treatment method and appropriate waste analysis). This notification will be in writing and occur within seven (7) days from the time when the TOCDF determines a waste has been generated that is not included in Table 2-0.

2.2.1.1 Chemical Agents GB, VX, HD/H/HT

2.2.1.1.1 Previous analyses of chemical agents have identified agent breakdown products, organic stabilizers, and metal constituents. Data compiled from these previous analyses have been used to establish expected ranges for agent purity, agent breakdown products, organic stabilizers, and metal constituents.

2.2.1.1.2 To ensure that the chemical agents treated at TOCDF do not contain higher concentrations of, or constituents in addition to, those previously identified, TOCDF will analyze the chemical agent throughout each agent/munition campaign.

2.2.1.1.3 The analysis scheme used to develop an agent profile will occur at the beginning of each munition or bulk container campaign. For bulk containers, agent samples will be collected from a representative number of bulk containers agreed upon with the DSHW. The samples will be analyzed for agent purity, agent breakdown products and Health Risk Assesssment (HRA) metals. For munitions, the same analyses will be done but the samples of agent will be collected from an ACS Tank.

2.2.1.1.4 Metals included in the HRA list are Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Thallium, Tin, Vanadium, and Zinc.

2.2.1.1.5 The metals analysis associated with the agent waste profile will be accomplished using the methods described in Tables 2-0 and 2-3. The metal analytes quantified will be the HRA metals listed in paragraph 2.2.1.1.4.

2.2.1.1.6 Once the initial bulk container/munition specific agent waste profile is established, agent feed rates to the incinerators will be adjusted, as necessary, to ensure that the metal feed rate limitations are not exceeded. For each 500 gallons collected in the ACS Tanks, one sample will be collected and analyzed for HRA metals. Every fifth 500-gallons shall be analyzed for percent organics, agent impurities and breakdown products, and density.

2.2.1.1.7 The metals analysis associated with the “every 500 gallon” agent samples may be performed using either the site specific or SW-846 methods described in Tables 2-0 and 2-3. Analytes quantified by the SW-846 methods will be those HRA metals listed in paragraph 2.2.1.1.4.

2.2.1.1.8 In addition to the analyses discussed above, an HRA metals confirmatory analysis shall be performed quarterly.

2.2.1.1.9 Based on the results of the “every 500 gallon” agent sample, agent feed rates to the incinerators will be adjusted, as necessary, to ensure continued compliance with the metal feed rate limits.

2.2.1.1.10 Appendix A of this waste analysis plan contains the following information regarding the chemical agents to be incinerated at the TOCDF:

- Table 2-A-1: Physical Properties of Chemical Agent (as a pure substance)

- Table 2-A-2: Chemical Agent Composition (agent percent purity ranges, by munition, and associated agent impurities)
- Table 2-A-3: GB Agent Purity (by agent manufacturing lot #, and munition lot #)
- Table 2-A-4: VX Agent Purity (by agent manufacturing lot #, and munition lot #)
- Table 2-A-5: HD Agent Purity (by agent manufacturing lot #, and munition lot #)

2.2.1.2 Spent Decontamination Solutions

2.2.1.2.1 Each tank of spent decontamination solution collected in SDS-TANK-101, SDS-TANK-102, or SDS-TANK-103 will be analyzed prior to incineration. Spent decontamination solutions will be analyzed for chemical agent concentration, corrosivity (pH), specific gravity, and screened for organics (using a GS/MS method). The purpose of the organic screen is to confirm that the spent decon solution waste stream was properly segregated from other waste streams.

2.2.1.2.2 If chemical agent is detected above 20 parts per billion (ppb) for GB, 20 ppb for VX, and 200 ppb for H/HD/HT, additional decontamination solution will be added to the tank, the contents of the tank will be recirculated (i.e., mixed) and another sample will be analyzed.

2.2.1.2.3 If results of the organic screen show the spent decon solution to contain organics in excess of five percent (5%), the tank of spent decon solution will be additionally analyzed for ignitability, TCLP/HRA metals (total), and TCLP organics (total).

2.2.1.3 Agent Collection System (ACS) & Agent Quantification System (AQS) Maintenance Residues

2.2.1.3.1 The chemical agent contaminated debris (i.e., filter elements, rags, gloves, etc.), and sludges generated from the maintenance of the Agent Collection System (ACS) and Agent Quantification System (AQS) equipment located in the Munitions Demilitarization Building (MDB), but outside the Explosive Containment Rooms (ECRs), can be incinerated in the MPF. Table 2-4 is a list of these allowable wastes.

2.2.1.3.2 Collected ACS/AQS maintenance residues will be weighed prior to incineration to ensure agent feed rates established for chemical agent to the MPF are not exceeded. The Operating Record will include a description of the residues fed to the MPF.

2.2.1.3.3 ACS/AQS maintenance residues may also be containerized and placed into permitted storage prior to treatment in the MPF.

2.2.1.4 Metallic Chemical Agent Contaminated Debris

2.2.1.4.1 Discarded components of MDB process equipment, discarded High Efficiency Particulate Air (HEPA) filters and carbon filter trays (from which all carbon has been removed) associated with the MDB filter system. Discarded chemical munition overpacks, and discarded tools used inside the MDB can be treated by incineration in the MPF to remove chemical agent surface contamination. The selection of wastes to be treated in the MPF

(other than drained munitions/bulk containers) is based on the potential of the surface of the waste to have been exposed to chemical agent. Table 2-4 is a list of these allowable wastes.

2.2.1.4.2 The physical state of these wastes (i.e., debris) prevents the collection of a representative sample. The Utah Division of Solid and Hazardous Waste (DSHW) code P999 describes all wastes included in this category.

2.2.1.4.3 Wastes included in this category will be placed onto MPF burn trays or ton containers that have been cut in half (cutaway ton containers CTC). All wastes will be weighed prior to being treated in the MPF to ensure the compliance with TOCDF RCRA Permit conditions. The Operating Record will include a description of the residues fed to the MPF in each burn tray or CTC.

2.2.1.4.4 Metallic chemical agent Contaminated Debris may also be containerized and placed into permitted storage prior to treatment in the MPF.

2.2.1.5 Drained Bulk Containers & Projectiles with Agent Residue

2.2.1.5.1 Drained bulk containers and projectiles to be treated in the MPF will contain un-drainable amounts of chemical agent. Previous analytical results show some of the chemical agent to contain concentrations of metals. In addition, the paints used on the containers and projectiles have metal containing pigments.

2.2.1.5.2 The chemical agents and the incombustible nature of the waste and item surface coatings (i.e., paint) are both organic matrices containing metal constituents. Metal constituents contained in organic matrices are referred to as non-embedded metals. Non-embedded metals may potentially volatilize during incineration.

2.2.1.5.3 Appendix B contains the following tables regarding the metals associated with each type of chemical agent munition and bulk container to be treated at the TOCDF:

- Table 2-B-1: Metals in Munitions (presents by munition or bulk container, the total metal loading for non-embedded metals whose emission rates are regulated by the TOCDF RCRA Permit)
- Table 2-B-2: Metal in Munitions (presents by munition or bulk container, the total metal loading for non-embedded metals whose emission rates are considered in the TOCDF HRA)

2.2.1.5.4 Data included in these tables can be used to determine the quantity (and associated feed rate) of non-embedded metals fed to the incinerator.

2.2.1.6 Energetic Munition Components

2.2.1.6.1 Energetic munition components (i.e., the fuzes, bursters, and propellants associated with the M55 rockets, projectiles, and mortar rounds) will be incinerated in the DFS.

2.2.1.6.2 The explosives, propellants, and related compounds were manufactured and loaded according to strict government specifications and standards; therefore, sufficient

information is available regarding their composition. The fill specifications will be used to determine the amount of explosive and propellant being fed to the DFS.

2.2.1.6.3 Appendix C contains the following tables pertaining to explosive/propellant and agent fill weights and compositions:

- o Table 2-C-1: Energetic/Agent Nominal Weight for Chemical Agent Munitions and Bulk Containers
- o Table 2-C-2: Munition Energetic Component Composition

2.2.1.6.4 Explosive and propellant formulations are organic matrices containing metal constituents. The metals contained in these formulations will potentially volatilize during incineration (i.e., the metals are non-embedded).

2.2.1.6.5 The quantity of each metal identified in Table 2-C-2 has been incorporated into Tables 2-B-1 and 2-B-2 found in Appendix B which present the total non-embedded metals for each munition and bulk container type to be treated at the TOCDF.

2.2.1.7 ECR Maintenance Residues

2.2.1.7.1 Maintenance performed on the demilitarization machines, Agent Quantification System (AQS) components, and Agent Collection System (ACS) components that are located in the Explosive Containment Rooms (ECR) will generate waste residues. Dry residues and sludge are placed into paper buckets prior to being fed to the DFS. A list of the ECR Maintenance Residues is provided in Table 2-2a.

TABLE 2-2a: Contaminated Waste	
Waste Stream	Allowable Waste Codes(s)
ECR Maintenance Residues	
• Chemical agent liquids, sludges and solids from AQS/ACS filters • Filter elements and bags • Munition fragments (fiberglass, metal and explosives) • Dust, dirt, debris, ECR sump sludge • Munition components/fragments (i.e., burster fragments, supplementary charges, spacers, support cups, lifting lugs, and fuze adaptors that fall onto the turntable or floor) • Clean-up material (e.g., rags, absorbent pads) • Cotton goods (e.g., coveralls, mop heads) • ECR Sump strainers • Unserviceable hand tools and metal hardware (e.g., nuts, bolts, washers) • Burlap bags • Mine components that fall onto the mine machine or floor	P999, F999, D003, D002, D004, D006, D007, D008, D009, D010

2.2.1.7.2 The Permittee shall decontaminate the unservicable hand tools and metal hardware identified in Table 2-2a and process them in the MPF. If the explosive residue remains on the tools after decontamination, the metal tools and hardware shall be processed in the DFS. The maintenance residues in Table 2-2a may be contaminated with small amounts of spent decontamination solution, agent, hydraulic fluid, or lubricating fluid. Explosives-contaminated rags generated by personnel wiping explosive residues from reject munitions in the UPMC or ECV shall be fed to the DFS.

2.2.1.7.3 ECR maintenance residues will be weighed prior to incineration to ensure the DFS agent and energetic feed rates limits are not exceeded.

2.2.1.8 Spent Activated Carbon

2.2.1.8.1 Activated carbon is used as a filter media to prevent the release of agent vapors from the MDB, and CAL. It is also used (should there be an agent release) to ensure the air in the Control Room and the on-site Medical Clinic is agent free (i.e., below the TWA for each chemical agent). Spent activated carbon will be incinerated in the DUN.

2.2.1.8.2 The quantity of chemical agent adsorbed on spent activated carbon will be determined by comparing the weight of equal volumes of spent activated carbon and virgin (unused) activated carbon. The increase in density of the spent carbon over the unused carbon will be attributed to the adsorbed chemical agent. This analysis will be done using a TOCDF Laboratory Operating Procedure (TE-LOP), which incorporates ASTM D2854 (Apparent

Density). ASTM D2854 will be followed until the approved TE-LOP incorporating this procedure is available.

2.2.1.8.3 Results of the Apparent Density Analysis will be used to determine a weight fraction of the chemical agent per pound of spent carbon. The operator will then be able to adjust the feed rate of spent carbon to the DUN to ensure compliance with agent feed rates specified through TOCDF RCRA Permit conditions.

2.2.1.8.4 Spent carbon will also be analyzed to determine the degree to which it has become saturated using a TOCDF Laboratory Operating Procedure which incorporates ASTM D4607 (Iodine Number). ASTM D4607 will be followed until the approved TE-LOP incorporating this procedure is available.

2.2.1.9 Agent Contaminated Dunnage

2.2.1.9.1 Dunnage generated in the TMA, which is contaminated with chemical agent, will be incinerated in the DUN.

2.2.1.9.2 Dunnage will be analyzed for TCLP/HRA metals (total), and TCLP organics (total). The analysis will be performed once during each agent/munition change or annually, whichever is shorter.

2.2.1.9.3 Dunnage associated with M55 rockets will additionally be analyzed for PCBs to demonstrate that contact with PCB regulated items (i.e., the M55 rocket shipping/firing tubes) did not cause cross-contamination of the dunnage.

2.2.1.9.4 Dunnage (i.e., wood, packing foam, metal banding) generated from chemical munitions or bulk containers unpacked in the TMA and contaminated with chemical agent will be containerized and placed into permitted storage HWMU until the DUN becomes operational.

2.2.1.10 Non Metallic Agent Contaminated Debris

2.2.1.10.1 Non metallic agent contaminated debris will be incinerated in the DUN. Examples of agent-contaminated debris are discarded butyl rubber personnel protective equipment which has contacted liquid or vapor chemical agent, discarded MDB maintenance equipment, which has contacted liquid or vapor chemical agent, and Chemical Assessment Laboratory (CAL) generated solid debris.

2.2.1.10.2 Because this waste stream is comprised of debris, a representative sample cannot be obtained for analysis. Therefore the TOCDF will apply knowledge of the waste or the process generating these wastes in association with TOCDF RCRA Permit conditions established through the DUN Agent Trial Burn results to ensure proper management practices.

2.2.1.10.3 Each waste feed charge to the DUN is weighed prior to incineration to ensure TOCDF RCRA Permit conditions are not exceeded. The TOCDF Operating Record will include an entry for each burn basket of waste fed to the DUN. Each of these entries will include a description of what the debris was composed of and the weight of the waste treated.

2.2.1.10.4 Non metallic agent contaminated debris will be containerized and placed into permitted storage until the DUN becomes operational.

2.2.1.11 Personal Protective Equipment (PPE) Respirator Carbon Filter Canisters

2.2.1.11.1 PPE respirators used exclusively to prevent the inhalation of chemical agent are made of activated carbon (i.e., whetlerite carbon).

2.2.1.11.2 Personal Protective Equipment (PPE) respirator carbon filter canisters that are generated in areas where the user is exposed to chemical agent vapors at concentrations above the TWA associated with each agent, and therefore contaminated with chemical agent, will be treated in the DUN.

2.2.1.11.3 PPE respirator carbon canisters are changed out immediately after use if the user has been in areas where chemical agent vapors were present to ensure they are not saturated. Because the carbon canisters are generated as waste before the carbon inside them has become saturated with chemical agent, the quantity of agent absorbed on the carbon is minimal.

2.2.1.11.4 Each burn basket of PPE carbon canisters to be treated in the DUN will be weighed prior to treatment. PPE carbon canisters contaminated with chemical agent will be placed into permitted container storage until the DUN is operational.

2.2.1.12 Spent Scrubber Brines

2.2.1.12.1 Pollution Abatement System (PAS) scrubber brines are collected in one of four Brine Reduction Area (BRA) storage tanks. Scrubber brines collected in the BRA tanks will be treated on-site in the BRA evaporators and drum dryers or shipped off-site to a Subtitle C TSDF, if the BRA's capacity is exceeded because of shutdown or excessive brine generation.

2.2.1.12.2 Each tank of scrubber brines to be treated in the BRA will be analyzed for chemical agent concentration, corrosivity (pH), and specific gravity. Each agent/munitions campaign or annually, whichever is shorter, the scrubber brines will also be analyzed for TCLP/HRA metals (total), and TCLP organics (total).

2.2.1.12.3 Scrubber brines generated from the treatment of M55 rockets will additionally be analyzed for PCBs. Brines having more than 3 parts per billion (ppb) PCB are a TSCA regulated waste and will be managed at an approved TSCA TSDF.

2.2.1.12.4 The analysis for metals and organics will be repeated if the result of the corrosivity analysis conducted on each batch of brines is found to be below a pH of 7.0.

2.2.1.12.5 Spent scrubber brines will only be treated in the BRA if the agent concentration in the brines is found to be below 20 ppb for GB, VX, and 200 ppb for H/HD/HT. If the agent concentration is greater than the values previously specified, decontamination solution will be added to the scrubber brines and the agent analysis will be repeated.

2.2.1.13 Miscellaneous Agent-Contaminated Liquid Wastes

2.2.1.13.1 Spent agent-contaminated hydraulic fluid and lubricating oil generated in the MDB will

be containerized and either placed into permitted storage or transferred to the ACS tanks (e.g., via BDS) and subsequently treated in the LIC primary chambers. Before transfer to the ACS tanks, the container(s) will be weighed (e.g., via BDS load cells or scale in TMA) and the contents will be sampled and analyzed (ref: Table 2.2.1). The corresponding results will be noted in the operating record.

2.2.1.13.2 Agent-contaminated hydraulic fluid, lubricating oil, and fuel oil generated in the MDB due to a release (e.g., caused by a system failure) in an area containing agent vapors will be managed as follows:

- o containerized and placed into permitted storage; or
- o containerized, the amount of material determined (e.g., via BDS load cells or scale in TMA), the contents sampled and analyzed (ref: Table 2.2.1), the corresponding results (weight and analytical) noted in the operating record, the contents subsequently transferred to an ACS tank (e.g., via the BDS), and then the waste processed in the LIC primary chambers.

Agent-contaminated hydraulic fluid and fuel oil may also be pumped to the ACS tanks, via the SDS collection system, and processed in the LIC primary chambers. If this means of waste transfer is used, a sample will be collected from the spent decon tank before it is transferred to the ACS tank (ref: Table 2.2.1).

2.2.1.13.3 Before treatment in the LICs, the samples described above will be analyzed for TCLP/HRA metals. The analytical results will be used to ensure that LIC metal feed rate limitations are not exceeded. Additionally, the associated manufacturer information (e.g., MSDSs, product data sheets, etc.) will be reviewed to identify the presence of the organic hazardous constituents identified in Permit Condition V.A.3.c. If any of these organic hazardous constituents are present, the waste will be placed into permitted storage (until an appropriate management option is identified by the TOCDF and approved by the DSHW) and will not be processed in the LICs. The results of the above analyses will be noted in the operating record.

2.2.1.14 <u>Bulk Containers Requiring Special Handling (GB Only)</u>

2.2.1.14.1 GB agent bulk containers with a Portable Isotopic Neutron Spectroscopy (PINS) ratio less than or equal to 5.0 must be pretreated to remove the heavy metal containing solids before the drained and rinsed bulk containers are fed to the MPF and shipped off-site in accordance with procedures specified in this attachment. This special handling rinse process is described in Attachment 14.

2.2.1.14.2 The final volume of rinse water associated with each bulk container rinsed out by the special handling process will be sampled and analyzed for HRA metals (excluding Aluminum, Beryllium, and Boron).

2.2.1.14.3 Metal concentrations in the final rinse shall be less than or equal to the values listed in Table 2-2c below. The rinse sequence includes, at a minimum, a decontamination rinse, a process water rinse, a weak acid rinse, and a process water rinse. As a minimum, the acid rinse and final process water rinse will be repeated if the final rinse metals concentrations specified in Table 2-2c are not met.

Table 2-2c
Special Handling Bulk Container
Final Rinse Metal Concentration Limits

Metal	Final Rinse Metals Concentration[1] (mg/Kg)	Metal	Final Rinse Metals Concentration[1] (mg/Kg)
Arsenic	235	Mercury	15
Selenium	150		

[1] The amount of final rinse volume that will remain behind after the final drain step and fed to the MPF has been determined to be 0.84 gallons, or 7 pounds.

2.2.1.14.4 If the metals concentrations specified in Table 2-2c cannot be met after three acid rinses, the bulk container shall be managed as described in Section 2.2.2.30.

2.2.2 **Analyses for Wastes Requiring Off-Site Treatment & Disposal**

The waste streams included in this section will be transported off-site for further treatment and ultimate disposal. The analytical parameters were selected based on process knowledge, previous analytical results obtained for waste streams generated by a similar facility (i.e., Johnston Atoll Chemical Agent Demilitarization System [JACADS]), and Land Disposal Restriction Notification requirements. The extraction method that will be used to determine Toxicity Characteristic parameter concentrations will be the Toxicity Characteristic Leaching Procedure (SW-846 Method 1311). Please note:

- Table 2-2 presents a summary of the characterization, as determined by JACADS, of waste streams similar to those the TOCDF will generate

- In the State of Utah, all the waste streams included in this section (with the exception of the dunnage generated in the UPA, treated GB scrap metal, and liquids generated in SUMP 110) will be characterized as F999 hazardous waste. Treated GB scrap metal is defined as metal from bulk containers, projectiles, and mortar rounds, which has undergone thermal decontamination in the MPF under normal operating parameters and has no residue remaining internally or externally on the scrap metal. Treated GB scrap metal must be managed in accordance with paragraph 2.2.2.6.6 of this attachment. Each shipment of F999 waste transported off-site must be accompanied by a hazardous waste manifest.

2.2.2.1 LIC 1/LIC 2 Slag

2.2.2.1.1 The incineration of chemical agent and the spent decontamination solutions in the Liquid Incinerators cause the generation of a "glass like" slag waste stream. Slag (in a molten state) accumulates in the secondary chambers of the LICs.

2.2.2.1.2 Each batch of slag will be removed by tapping the slag extension of the secondary chamber and draining the molten slag into refractory lined drums or by chipping the solidified slag and placing the slag into containers. Each LIC secondary chamber is equipped with a view port that allows the operator to visually determine the slag level within the secondary chamber. The slag shall be removed before the slag level reaches

the top of the view port.

2.2.2.1.3 Each batch of LIC slag generated will be analyzed for TCLP metals.

2.2.2.2 Treated M55 Rocket Parts/Fiberglass/Ash

2.2.2.2.1 Ash and debris collected at the DFS Heated Discharge Conveyor (HDC) output, and that is generated during the treatment of M55 rockets, will be analyzed for the chemical agent concentration, TCLP metals and organics, and PCBs. If analytical results demonstrate this waste to be Toxicity Characteristic for organics, this waste will additionally be analyzed for dioxins/furans. The dioxin/furan analysis will occur at the same frequency as the analysis of TCLP metals, organics and PCBs.

2.2.2.2.2 Solid residues resulting from the treatment of M55 rockets having more than 2 parts per million (ppm) PCB are a TSCA regulated waste and will be managed at an approved TSCA TSDF.

2.2.2.2.3 The detoxification of waste residues exiting the DFS is maintained during upset conditions by features built into the control logic of the incinerator. When selected AWFCO are activated, the process control software causes the kiln to oscillate and the HDC to stop, when necessary, to prevent the discharge of waste residues until operating parameters associated with the kiln and HDC temperature and motion are restored. The kiln continues to rotate forward and HDC motion is maintained when AWFCO that are not related to kiln and HDC temperatures (or motion) are activated. Table D-7-2 in Attachment 19 shows the different AWFO scenarios for the kiln and HDC.

2.2.2.2.4 In the event that waste is discharged from the HDC during an upset condition. TOCDF will document the circumstances in the operating record and analyze one sample taken from each HDC waste bin generated during the upset condition for agent concentration (if agent is included in the DFS feed stream).

2.2.2.3 Treated Burster Casings/Fuse Bodies/Ash

2.2.2.3.1 During the projectile campaigns, residues collected at the DFS HDC output will consist of ash, empty burster casings and fuse bodies. The bursters are removed in the ECRs leaving the projectile's burster well intact and the projectile's agent cavity unopened. Projectile agent cavities are opened in the Munition Processing Bay (MPB) just prior to the agent draining process step.

2.2.2.3.2 Ash and debris generated from the incineration of bursters and fuses removed from projectiles/mortars will be analyzed for TCLP metals and organics.

2.2.2.4 Treated Mines/Fuse Bodies/Ash

2.2.2.4.1 VX mines will be punched and drained of their chemical agent fill in ECR B. The drained mine body and the mine's associated energetic components will then be fed to the DFS. During the VX mine campaign, DFS HDC residues will consist of mine bodies, fuse bodies, and ash.

2.2.2.4.2 The ash portion of this waste stream will be analyzed for chemical agent concentration,

TCLP metals and organics.

2.2.2.5 DFS PAS Cyclone Residues

2.2.2.5.1 DFS cyclone residues will be analyzed for the parameters of chemical agent concentration, TCLP metals and organics. If analytical results demonstrate this waste to be Toxicity Characteristic for organics, this waste will additionally be analyzed for dioxins/furans. The dioxin/furan analysis will occur at the same frequency as the analysis of TCLP metals, and organics.

2.2.2.5.2 DFS cyclone residues generated during M55 rocket processing will additionally be analyzed for PCBs. Solid residues resulting from the treatment of M55 rockets having more than 2 parts per million (ppm) PCB are a TSCA regulated waste and will be managed at an approved TSCA TSDF.

2.2.2.5.3 DFS PAS cyclone residues having a chemical agent concentration below 20 parts per billion (ppb) for GB, 20 ppb for VX, and 200 ppb for H/HD/HT, will be transported to an off-site Subtitle C TSDF for further treatment and ultimate disposal.

2.2.2.5.4 DFS PAS cyclone residues having an agent concentration greater than 20 parts per billion (ppb) for GB, 20 ppb for VX, and 200 ppb for H/HD/HT will be placed into permitted container storage until a treatment method is available.

2.2.2.6 Treated Bulk Containers/Projectiles/Mortar Rounds (Scrap Metal)

2.2.2.6.1 Each burn tray exiting the MPF undergoes an agent hazard assessment. The presence of chemical agent is determined by an Automatic Continuous Air Monitoring System (ACAMS) located at the MPF discharge airlock. If chemical agent is detected, the munitions/bulk containers are moved back into the MPF to undergo further thermal treatment.

2.2.2.6.2 The MPF is designed with double-door airlock systems located on both the charge and discharge end of the primary combustion chamber (PCC). These systems prevent PCC combustion gases and agent vapors from being discharge to the MDB or the atmosphere when burn trays charged and discharged respectively.

2.2.2.6.3 The MPF primary combustion chamber is divided into two or three zones, depending upon the type of munition processed. Treatment through the MPF requires that each burn tray charge remain in each zone for a preset period of time (from 20 to 40 minutes depending on the type of drained munitions or bulk containers being processed). When in a three-zone operation, the time period each burn tray remains in Zone 3 is less than the time it remains in Zones 1 and 2. At a preset time the burn tray in Zone 3 is advanced into the MPF discharge airlock. Burn trays in Zones 1 and 2 are not advanced (i.e., Zone 3 is empty since the burn tray in Zone 2 was not advanced). If a two-zone operation is used, each burn tray charge remains in Zone 1, Zone 2, and the discharge airlock for a minimum of 30 minutes, 20 minutes, and 10 minutes, respectively. When a burn tray advances to the discharge airlock, Zone 2 is empty for approximately 10 minutes while the ACAMS in the discharge airlock is used to monitor the treated munition.

2.2.2.6.4 While in the discharge air lock the contents of the burn tray are monitored for the

presence of chemical agent using an ACAMS. The burn tray remains in the MPF discharge airlock for sufficient time for the ACAMS to complete one cycle.

2.2.2.6.5 If chemical agent is detected above the Surgeon Generals established Time Weighted Average (TWA) for the chemical agent being processed, the burn tray in the MPF discharge airlock is moved back into Zone 3 (or Zone 2 if the MPF is in a two-zone operation) for additional processing. If no agent is detected, the burn tray exits the MPF discharge airlock by being advanced to the MPF cool-down conveyor.

2.2.2.6.6 Treated GB scrap metal will be sent off-site and will be: (1) managed as scrap metal and recycled exclusively by smelting; or (2) managed as a hazardous waste and disposed at an approved, off-site Subtitle C TSDF. For disposal, manifest requirements must be adhered to. F999 scrap metal shall be managed as described in Item (2) above.

2.2.2.6.7 Agent VX and HD scrap metal will be managed as an F999 waste and be transported over public roads accompanied by a hazardous waste manifest describing waste as an F999 Utah listed hazardous waste. Before shipment of GB, VX and HD scrap metal, loose residue in the interior and on the exterior of the scrap metal will be removed (e.g., vacuumed, etc.). The residue removed will be analyzed and managed according to the requirements described below for the MPF Burn Tray and CTC residues (ref: section 2.2.2.8). Any GB treated scrap metal, which contains residue that cannot be removed, will be considered a F999 waste and the requirements specified in paragraph 2.2.2.6.6(2) must be followed.

2.2.2.7 MPF Treated Debris

2.2.2.7.1 HEPA filters, carbon filter trays (from which the carbon was removed prior to treatment in the MPF), munitions overpacks, shipping containers, process equipment, and tools treated in the MPF to remove surface contamination are processed through the MPF on burn trays or CTC.

2.2.2.7.2 Each burn tray or CTC exiting the MPF is analyzed for chemical agent as described in paragraphs 2.2.2.6.3 through 2.2.2.6.5.

2.2.2.7.3 This MPF treated debris waste stream will be managed separately from the scrap metal waste stream and will not be recycled, with the exception of the following miscellaneous metal wastes; munition overpacks, piping, conveyors, drain probes, and shear blades. Miscellaneous metal wastes may be treated as scrap metal and recycled in accordance with paragraphs 2.2.2.6.6 and 2.2.2.6.7.

2.2.2.8 MPF Burn Tray and Cutaway Ton Container Residues

2.2.2.8.1 MPF burn tray and CTC residues will be comprised primarily of incinerated paint flake residues and treated ACS/AQS maintenance residues. Residues will be removed from each tray before the tray is routed back through the MDB. The burn tray residues are swept/vacuumed from the burn tray and placed into a container.

2.2.2.8.2 MPF burn tray residues will be analyzed for chemical agent concentration, TCLP metals and organics.

2.2.2.8.3 The residue waste stream resulting from the MPF incineration treatment of the agent contamined material identified in Table 2-4 shall be managed separately from the munitions metal residues and shall not be recyled. This waste stream must be shipped to an approved hazardous waste facility for disposal.

2.2.2.9 DUN Debris/Ash

2.2.2.9.1 The DUN is used to treat process-generated wastes. Wastes will be processed in the DUN by waste type Amini-campaigns@ (i.e, waste types will be segregated and all the waste containers having similar waste descriptions and contaminated with the same type of chemical agent will be treated during the mini-campaign).

2.2.2.9.2 Debris/ash generated by the DUN will be analyzed for chemical agent concentration, TCLP metals and organics. These analyses will be repeated for each mini-campaign. If analytical results demonstrate the DUN debris/ash generated during any waste type mini-campaign to be Toxicity Characteristic for organics, DUN debris/ash will additionally be analyzed for dioxins/furans. The dioxin/furan analysis will occur at the same frequency as the analysis of TCLP metals, and organics.

2.2.2.10 DUN PAS Baghouse Ash

2.2.2.10.1 Ash generated by the DUN PAS Baghouse is managed separately from that collected at the DUN ash-gate. As described in the previous section, wastes will be processed in the DUN by waste type mini-campaigns.

2.2.2.10.2 Ash generated by the DUN PAS Baghouse will be analyzed for chemical agent concentration, TCLP metals and organics. These analyses will be repeated for each mini-campaign. If analytical results demonstrate this waste to be Toxicity Characteristic for organics, this waste will additionally be analyzed for dioxins/furans. The dioxin/furan analysis will occur at the same frequency as the analysis of TCLP metals, and organics.

2.2.2.11 Incinerator Refractory

Upon change out, the discarded refractory lining of the incinerator primary and/or secondary chambers will be analyzed for TCLP metals.

2.2.2.12 PAS Residues

2.2.2.12.1 PAS residues are comprised of scrubber brine precipitate and filter elements. The precipitate is collected in the bottom of the PAS process tanks (i.e., the quench towers, packed bed scrubbers, and demister vessels), and the PAS brine filters.

2.2.2.12.2 The PAS residues are expected to be of a similar composition to that of the scrubber brine salts (the waste stream generated from drying the scrubber brines in the BRA evaporators and drum dryers).

2.2.2.12.3 The PAS residues generated by each incinerator will be analyzed for the parameters of chemical agent concentration, corrosivity (pH), free liquids, TCLP metals and organics.

2.2.2.12.4 DFS PAS residues generated during the processing of M55 rockets will additionally be

analyzed for PCBs. Solid residues having more than 2 parts per million (ppm) PCB are a TSCA regulated waste and will be managed at an approved TSCA TSDF.

2.2.2.13 Spent Scrubber Brines

2.2.2.13.1 Scrubber brines are removed from the Pollution Abatement System (PAS) as the process control equipment generates them. Spent scrubber brines will be accumulated in BRA-TANK-101, BRA-TANK-102, BRA-TANK-201, and BRA-TANK-202.

2.2.2.13.2 In the event the on-site treatment capacity of the Brine Reduction Area is exceeded because the BRA is in operable or the scrubber brine generation exceeds the capacity of the BRA, TOCDF will transport the excess scrubber brines to an off-site TSDF for further treatment and ultimate disposal.

2.2.2.13.3 Spent scrubber brines to be transferred off-site for further treatment and ultimate disposal will be analyzed for chemical agent concentration, corrosivity (pH), density, TCLP metals and organics, total dissolved solids (TDS), and total suspended solids (TSS).

2.2.2.13.4 Each tank or tanker will be analyzed for agent concentration, specific gravity, and corrosivity (pH).

2.2.2.13.5 Spent scrubber brines will only be shipped off-site for further treatment and ultimate disposal if the agent concentration in the brines is below 20 ppb for GB and VX, and 200 ppb for H/HD/HT.

2.2.2.13.6 Spent scrubber brines transferred off-site will also be analyzed for PCBs, if the brines are generated from the processing of M55 rockets. Scrubber brines having more than 3 parts per billion (ppb) PCB are a TSCA regulated waste and will be managed at an approved TSCA TSDF.

2.2.2.14 SDS-TANK Sludges

2.2.2.14.1 Filters located at the output of the SDS-TANKS and prior to the LIC secondary chambers collect salt that have precipitated out of spent decon solution. The sludge removed from the filters associated with the SDS-TANKs will be analyzed for chemical agent, corrosivity (pH), free liquids, TCLP metals and TCLP organics.

2.2.2.14.2 SDS-TANK sludges will only be shipped off-site for further treatment and ultimate disposal if the agent concentration in the sludges is below 20 ppb for GB and VX, and 200 ppb for H/HD/HT. If the agent concentration is found to be greater than the previous listed values, decontamination solution will be added to the accumulation container and the analysis for chemical agent, pH, and free liquids will be repeated.

2.2.2.15 BRA-TANK Sludges

2.2.2.15.1 Between agent campaigns, the scrubber brine sludge that has collected in the BRA-TANKs is removed. This waste stream is expected to have the same characteristics as the BRA salts.

2.2.2.15.2 BRA-TANK sludges will be analyzed for agent concentration, pH, free liquids, TCLP

metals and organics.

2.2.2.15.3 BRA-Tank sludges generated during M55 rocket campaigns will additionally be analyzed for PCBs.

2.2.2.15.4 Waste residues containing liquids having a PCB concentration greater than 3 ppb PCB are a TSCA regulated waste and will be managed at an approved TSCA TSDF.

2.2.2.16 PAS Demister Candle Sleeves

2.2.2.16.1 The demister candles from each PAS will be analyzed for chemical agent concentration, TCLP metals and organics.

2.2.2.16.2 Demister candle sleeves generated by the DFS PAS during the processing of M55 rockets will additionally be analyzed for PCBs. Demister candle sleeves having more than 2 parts per million (ppm) PCB are a TSCA regulated waste and will be managed at an approved TSCA TSDF.

2.2.2.17 Scrubber Brine Salts

2.2.2.17.1 The on-site treatment of spent scrubber brines involves the concentration of the brines stored in one of the four BRA-TANKs in one of two BRA evaporators and further de-watering (by evaporation) of the concentrated brine in the one or more of three BRA drum dryers. The output of the BRA drum dryers is referred to as scrubber brine salts.

2.2.2.17.2 This waste stream will be analyzed for chemical agent concentration, corrosivity (pH), free liquids, TCLP metals and organics.

2.2.2.17.3 Scrubber brine salts generated during the processing of M55 rockets will additionally be analyzed for PCBs. Solid residues having more than 2 part per million (ppm) PCBs are a TSCA regulated waste and required to be managed at an approved TSCA TSDF.

2.2.2.18 BRA PAS Knockout Box Residues

2.2.2.18.1 A component of the BRA PAS is a knockout box. The function of this equipment is to remove excess moisture from the exhaust streams of the BRA drum dryers and evaporators. The knockout box is located in the same room as the BRA evaporators and drum dryers (see TOCDF Permit Drawing TE-2-D-505).

2.2.2.18.2 Residues from the knockout box will be analyzed for the same parameters as the scrubber brine salts. Analytes detected in the scrubber brine salts are expected to be present in the knockout box residues. The knockout box residues are expected to have higher water content than the scrubber brine salts.

2.2.2.19 BRA PAS Baghouse Residues

These residues will be analyzed for the same parameters as the scrubber brine salts. Analytes detected in the scrubber brine salts are expected to be present in the BRA PAS baghouse residues.

2.2.2.20 Dunnage Generated in the Unpack Area

2.2.2.20.1 Dunnage generated in the UPA will be analyzed for chemical agent to determine if it must be managed as a listed hazardous waste. If analysis of an extract made from a samples of the dunnage demonstrates that agent is present in the extract above 20 ppb for GB and VX, and 200 ppb for H/HD/HT, the dunnage will be managed as a P999 listed hazardous waste. Dunnage managed as P999 waste will be incinerated in the DUN. Until the DUN becomes operational, dunnage managed as P999 waste will be place into permitted storage.

2.2.2.20.2 A wood plane will be used to generate samples of dunnage for analysis. Samples will be taken from areas of the dunnage that are the most discolored, or stained.

2.2.2.20.3 If analysis of an extract made from a samples of the dunnage demonstrates that no agent is present in the extract (i.e., agent analytical results at or below 20 ppb for GB and VX, and 200 ppb for H/HD/HT). The dunnage will not be managed as a P999 or F999 listed hazardous waste and managed off-site.

2.2.2.20.4 To determine if dunnage generated in the UPA must be managed as a Toxicity Characteristic hazardous waste, dunnage will be analyzed for the parameters of TCLP/HRA metals (totals, and TCLP), and TCLP organics (totals, and TCLP). It should be noted that total metals and organics are analyzed to provide sufficient information to allow for the incineration of the dunnage generated during the same munition campaign, which is contaminated with agent and generated in the TMA.

2.2.2.20.5 Dunnage associated with the M55 rockets will additionally be analyzed for PCBs to demonstrate that contact with PCB regulated items (i.e., the M55 rocket shipping/firing tubes) did not cause cross contamination of the dunnage.

2.2.2.21 DPE Suits

2.2.2.21.1 Demilitarization Protective Ensemble (DPE) suits are encapsulating, supplied air PPE worn by personnel required to enter areas in the MDB where agent liquid or vapors are known to exist. DPE suits are made of polyvinyl chloride. Discarded DPE suits that contacted liquid chemical agent during their use will be managed separately from those that were exposed exclusively to only chemical agent vapors.

2.2.2.21.2 DPE suits that came into contact with liquid chemical agent will be managed on-site as P999 hazardous wastes.

2.2.2.21.3 Discarded DPE suits that were exposed to chemical agent vapors exclusively will be analyzed for chemical agent to determine if they must be managed on-site as a P999 hazardous waste or off-site as a F999 hazardous waste. Chemical agent vapor exposed DPE suits will be managed on-site as a P999 listed hazardous waste if analysis of an extract made from samples of the DPE suits demonstrates that agent is present in the extracts above 20 ppb for GB and VX, and 200 ppb for H/HD/HT.

2.2.2.21.4 DPE suit samples will be collected from the section of the suit most likely to become contaminated while being worn by the wearer rubbing up against agent contaminated equipment, that is, the front-lower mid-section of the suit.

2.2.2.21.5 DPE suits to be managed, as a P999 listed hazardous waste will be placed into permitted container storage in Area 10 until a method of treatment is available. Methods for treating contaminated DPE suits are under investigation at the Chemical Agent Munitions Disposal System (CAMDS) located at the Deseret Chemical Depot.

2.2.2.21.6 DPE suits will be managed off-site as an F999 listed hazardous waste, if analysis of an extract made from samples of the DPE suits demonstrates that no agent is present in the extract (i.e., agent analytical results at or below 20 ppb for GB and VX, and 200 ppb for H/HD/HT).

2.2.2.22 Spent MDB Equipment Hydraulic Fluid and Lubricating Oil

2.2.2.22.1 Spent hydraulic fluid and lubricating oil generated in the MDB will be analyzed for chemical agent concentration, TC/HRA metals (Total and TCLP), and TC organics (Total and TCLP).

2.2.2.22.2 MDB generated spent hydraulic fluid and lubricating oil having agent concentrations less than 20 ppb for GB and VX, and 200 ppb for H/HD/HT will be managed at off-site Subtitle C TSDF.

2.2.2.22.3 MDB generated spent hydraulic fluid contaminated with chemical agent above 20 ppb for GB and VX, and 200 ppb for H/HD/HT, will be processed in the LIC primary chamber, or containerized and placed into permitted storage until such time that a permit modification to allow for the treatment of this waste stream in the LIC is approved.

2.2.2.22.4 The failure of a mechanical system inside the MDB could result in the generation of fluids contaminated with chemical agent and be comingled with spent decon solution. These fluids will be collected in sumps, transferred to SDS-TANK-101, SDS-TANK-102 or SDS-TANK-103, and managed as described in Section 2.2.1.2 or 2.2.2.28.

2.2.2.23 Spent MDB Equipment Lubricating Oil

2.2.2.23.1 Spent lubricating oil generated in the MDB and sent off site for disposal will be analyzed for agent concentration, TC/HRA metals (Total), and TC organics (Total).

2.2.2.23.2 Spent MDB lubricating oil could be transported off-site for further treatment and ultimate disposal at a Subtitle C TSDF only if the agent concentration in the waste is below 20 ppb for agents GB and VX, and 200 ppb for agent H/HD/HT.

2.2.2.24 CAL Aqueous Wastes

2.2.2.24.1 Operation of analytical equipment within the CAL results in the generation of an aqueous waste stream. Past analytical results have shown this waste stream to have a pH below 2 and contain metals above the regulatory limits.

2.2.2.24.2 CAL aqueous waste will be analyzed for the parameters of agent concentration, corrosivity (pH), ignitability, TCLP metals and organics.

2.2.2.24.3 CAL aqueous wastes will be transported off-site for further treatment and ultimate

disposal at a Subtitle C TSDF only if the agent concentration in the waste is below 20 ppb for agents GB and VX, and 200 ppb for agent H/HD/HT.

2.2.2.25 CAL Solid Wastes (debris)

2.2.2.25.1 CAL generated solid wastes consist of discarded glassware, wipe cloths, paper, gloves, plastic, wood, pipet tips, DAAMS tubes, transfer tubes, discarded analytical equipment components, and vermiculite.

2.2.2.25.2 Each individual item comprising this waste stream is decontaminated before it is placed into the accumulation container. Over time as the container is filled, decon solution (that once clung to the item) collects in the bottom of the container. A sample of this residual decon solution will be taken from the bottom of each container of CAL solid debris generated and analyzed for chemical agent.

2.2.2.25.3 Containers having analytical results demonstrating the agent concentration in the decon solution is below 20 ppb for GB and VX, and 200 ppb for H/HD/HT, will be managed off-site as F999 listed hazardous wastes.

2.2.2.25.4 Containers having analytical results demonstrating the agent concentration in the decon solution is above the values listed in the previous paragraph will be managed on-site as P999 hazardous waste and be treated in the DUN. Wastes to be treated in the DUN will be placed into permitted storage until the DUN becomes operational.

2.2.2.26 MSB Solid Waste (debris)

2.2.2.26.1 MSB generated solid wastes consist of wipe cloths, personal protective equipment, discarded monitoring system components (e.g., tygon tubing, VX conversion pads, DAAMS tubes, transfer tubes, discarded analytical equipment, etc.).

2.2.2.26.2 This waste stream will be sampled, analyzed and managed as described in paragraphs 2.2.2.25.2 through 2.2.2.25.4

2.2.2.27 Sump 110

2.2.2.27.1 Sump 110 is designed to receive precipitation run-off collected on the incinerator PAS concrete pads. In the event of a PAS process equipment leak, the potential exists for SUMP 110 to also accumulate incinerator PAS liquids/solids (e.g., scrubber brines). These liquids/solids generated from the treatment of chemical agents and chemical agent munitions are a listed hazardous waste in Utah.

2.2.2.27.2 If the material (either liquid or solids) accumulated in SUMP 110 is to be transferred off-site for treatment and/or disposal, a sample of the material will be analyzed for agent concentration, TCLP metals, and organics. If the agent concentration is below 20 ppb for GB or VX, or below 200 ppb for H/HD/HT, then the material may be transferred off-site for treatment and/or disposal.

2.2.2.27.3 Unless the TOCDF can demonstrate in accordance with 40 CFR 261.3(d) that the material removed from the sump is not a hazardous waste, the material will be managed as a hazardous waste. For the purposes of demonstrating that the material does not

contain a listed waste (e.g., spent scrubber brine), or is not derived from a listed waste, the analytical results must indicate that the concentrations for agent, TC metals, and TC organics are below the corresponding detection limits. If the concentrations are below the detection limits, then the material will not be a listed waste and will not be assigned an F999 waste code.

2.2.2.27.4 To determine if liquid collected in SUMP 110 will be treated on-site or transferred off-site for further treatment and eventual disposal, the liquids will be visually inspected for the presence or absence of a surface oil sheen. SUMP 110 liquids having a surface oil sheen (which is evidence that organics were mixed with the sump contents will not be transferred to the BRA for on-site treatment.

2.2.2.27.5 If material accumulated in SUMP 110 is to be transferred off site for treatment and/or disposal, the material contained within each tanker to which Sump 110 contents are transferred, will be sampled and analyzed for agent concentration, TCLP metals and organics to confirm, for each tanker load, that agent concentrations are below the levels identified above and to enable proper manifesting of each waste shipment.

2.2.2.27.6 Instead of off-site treatment/disposal, the liquid accumulated in Sump 110 may be transferred to one of the BRA-Tanks provided no surface oil sheen is visually present. Likewise, any solid material removed from the sump may be containerized and then stored and/or treated on-site.

2.2.2.28 Spent Decontamination Solutions

2.2.2.28.1 Sodium hydroxide-based spent decontamination solutions generated during the GB campaign may be treated on site by incineration or shipped off site for disposal. The decontamination solutions used for VX and mustard agent campaigns shall be incinerated on site. Each tank of spent decontamination solution collected in SDS-TANK-101, SDS-TANK-102, and SDS-TANK-103 shall be analyzed for chemical agent concentration, corrosivity (pH), specific gravity, BTU (heat content), ignitability, total halogens, total organics, explosives and TC metals. The purpose of the organic analysis is to confirm that the spent decontamination solution waste streams were properly segregated from other waste streams.

2.2.2.28.2 If chemical agent concentrations are below 20 parts per billion (ppb) for GB, then the GB spent decontamination solution may be shipped off site for disposal. If chemical agent is detected at or above 20 ppb, additional decontamination solution shall be added to the SDS tank, the contents of the tank shall be recirculated (i.e., mixed) and another sample analyzed.

2.2.2.28.4 Before transfer to tanker trucks, the 90-day tank shall be analyzed for chemical agent concentrations, pH, and specific gravity. Once the sample is taken, no additions may be added to the 90-day tank.

2.2.2.28.5 In addition to the above, the following restrictions shall apply to off site shipments:

2.2.2.28.5.1 The TOCDF shall impose contractual restrictions on the transporters and off site management facilities to ensure that the spent decontamination solutions are directly fed into an incinerator from either the tanker truck or tank(s) dedicated to storing only this

waste stream; no commingling of waste streams.

2.2.2.28.5.2 The TOCDF shall impose contractual restrictions on the transporters and off site management facilites to ensure the spent decontamination solution pH is not lowered in each tanker or in the off-site tank(s) dedicated to storing only this waste stream.

2.2.2.28.5.3 The off site treatment facilities to which the TOCDF may ship are limited to hazardous waste incineration facilites.

2.2.2.28.5.4 The off site transporters and management facilities shall be trained in chemical agent exposure and spill response before shipment.

2.2.2.29 Residues Resulting from the Special Handling of GB Agent Bulk Containers

2.2.2.29.1 Waste resulting from the treatment of bulk containers requiring special handling include the successfully rinsed out containers that have been processed through the MPF, liquid rinsate (i.e., spent decontamination solution), and rinsate solids. The MPF processed bulk containers will be managed as specified in Section 2.2.2 of this attachment.

2.2.2.29.2 Special handling rinse material will be accumulated and treated in accordance with R315-5-3.34. The solutions and suspended solids resulting from each bulk container rinse are collected and mixed in the Conditioning and Settling System (CSS). The pH of the rinsate will be adjusted above 9 using sodium hydroxide to ensure agent neutralization and then will be lowered as necessary for optimum metals precipitation.

2.2.2.29.3 The pH adjusted rinsate will be transferred to a settling device where the heavy metals fall out of solution, allowing the liquid and solid residues to be separated. After settling is complete, the separated liquids will be transferred to the SDS Tanks and managed as spent decontamination solution. Spent decontamination management requirements are specified in Sections 2.2.1.2 or 2.2.2.28 of this attachment.

2.2.2.29.4 Spent decontamination solutions from the CSS that are incinerated on site shall be fed to the Liquid Incinerator (LIC) Secondary Chambers in accordance with the metal feed rates specified for the LIC primary chambers. Spent decontamination solutions from the CSS and chemical agent shall not be fed at the same time.

2.2.2.29.5 Solids generated from the CSS will be analyzed for agent concentration, TCLP metals, and TCLP organics. Waste found to have an agent concentration greater than the WCL will be treated with additional decontamination solution until the agent is destroyed. These analyses will be performed once each time the conditioning device or settling device is cleaned out. These solids will be shipped off-site to a Subtitle C TSDF.

2.2.2.30 GB Agent Bulk Containers Failing Special Handling

2.2.2.30.1 Bulk containers that are unable to be successfully rinsed out by the special handling process will be manages as F999 hazardous waste as a minimum (additional waste codes may apply) and be shipped to an off-site Subtitle C TSDF.

2.2.2.30.2 An analysis will be performed on failed bulk containers to ensure there will be no environmental or health impacts resulting from their off-site management. Samples of

the final rinse volume and any solids remaining in the bulk container will be taken. The final rinse volume will be analyzed for pH and agent. The solids will be analyzed for TCLP metals, TCLP organics, and agent.

2.2.2.30.3 Bulk containers failing the special handling process will be shipped to an off-site Subtitle C TSDF provided the agent analytical results for the final rinse and solids sampling show the agent concentrations to be less than 20 ppb.

2.2.2.31 Non Agent Contaminated Mine Drums

2.2.2.31.1 Each individual mine drum will be assigned a unique identifying number for tracking purposes. The status of each mine drum, including the criteria listed below, will be tracked on appropriate forms and documented in the facility operating record.

2.2.2.31.2 Mine drums, lids, rings and packing material that have not been contaminated by agent will be transported off-site and managed as a non-RCRA waste. The mine drums may be crushed in the UPA to facilitate loading and transport. To be considered uncontaminated, all the following conditions must be satisfied:

(1) the waste material was not associated with leakers;
(2) the operators inspect the interior of each mine drum when unpacking and no liquid is detected when removing the mines from the associated mine drum;
(3) the ACAMS readings for the ECV were less than 0.5 TWA for VX during the time the mine drums were unpacked in the ECV;
(4) the waste material was monitored in the airlock between the ECV and the UPA and was shown to be less than 0.5 TWA for VX

2.3 PARAMETER TEST METHODS 40 CFR 264.13(b)(2); [R315-8-2.4]

2.3.1 Table 2-3 provides a listing of the test (analytical) methods that will be used to detect and quantify the selected parameters. This information is presented in a relational format in Tables 2-0 and 2-1 (the WAP Summary Table).

2.3.2 The on-site Chemical Assessment Laboratory (CAL) will perform the analyses related to chemical agent, corrosivity (pH), and free liquids. The CAL will additionally perform the analyses associated with activated carbon (i.e., Apparent Density and Iodine Number). The above referenced analyses are incorporated into TOCDF Laboratory Operating Procedures (TE-LOP-572, TE-LOP-574, and TE-LOP-584).

2.3.3 The CAL is certified by the state of Utah to perform methods, which are included in the EPA document titled Test Methods for Evaluating Solid Waste (SW-846), namely corrosivity (method 9040) and free liquids (method 9095).

2.3.4 An off-site laboratory will perform the analyses for metals, TCLP Metals, HRA Metals, TCLP Organics, Total Dissolved Solids (TDS) and Total Suspended Solids (TSS). When required, the selected off-site laboratory will also perform the Toxic Characteristic Leaching Procedure (TCLP, Method 1311).

2.3.5 The off-site laboratories selected will be certified by the state of Utah.

2.4 SAMPLING METHODS 40 CFR 264.13(b)(3); [R315-50-6]

See the last column in Tables 2-0 and 2-1 (the WAP Summary Table) for the sampling methods to be used for each waste stream.

2.5 FREQUENCY OF ANALYSES 40 CFR 264.13(b)(4); [R315-8-2.4]

See the second to the last column of Tables 2-0 and 2-1 (The WAP Summary Table) for the frequencies at which each waste stream will be sampled and analyzed.

2.6 ADDITIONAL REQUIREMENTS FOR WASTES GENERATED OFF-SITE 40 CFR 264.13(b)(5); [R315-8-2.4]

The TOCDF is not permitted to store or treat waste generated off-site. The TOCDF is only permitted to store treated wastes generated by the facility having EPA ID Number UT5210090002.

2.7 ADDITIONAL REQUIREMENTS FOR IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTES 40 CFR 264.13(b)(6); [R315-8-2.4]

Federal regulations require that container storage HWMU managing ignitable and reactive hazardous waste must be located at least 50 feet away from the facility's property line. A review of the facility area map found in Attachment 1 (Facility Description) of the TOCDF RCRA Part B Permit demonstrates the permitted container storage HWMU associated with the TOCDF (i.e., the CHB) is located more than 50 feet away from the TCA property line.

2.8 RECORDKEEPING REQUIREMENTS 40 CFR 264.73(b)(3); [R315-7-12.4]

Analytical results generated in compliance with the TOCDF Waste Analysis Plan are maintained on file at the facility as part of the operating record. The analytical results are part of the data package generated by the CAL each day. CAL data packages generated within the previous four months are available for review at the CAL. CAL data packages older than four months are available for review at the Document Control Center.

2.9 SAMPLING AND ANALYSIS QA/QC PROCEDURES

Appendix D describes the Quality Assurance/Quality Control procedures established at the TOCDF to ensure integrity and accuracy of the waste sampling and analysis effort.

Table 2-0
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.1 WASTES REQUIRING ON-SITE TREATMENT

WASTE STREAM	TREATMENT UNIT(S)	ANALYTICAL PARAMETERS	ANALYTICAL METHODS[1]	FREQUENCY OF ANALYSIS (establish profile)	SAMPLING METHOD
1. Chemical Agent (Initial Waste Profile)	LIC 1 LIC 2 MPF DFS DUN	Agent % Purity HRA Metals (Total) Agent Organic Impurities Agent Breakdown Products	TE-LOP-584 3010A/3050B, TE-LOP-584, 6010B/6020/7470A and TE-LOP-557 TE-LOP-584 TE-LOP-584	Number of samples collected and analyzed based on a DSHW approved sampling and analysis plan.	DSHW Approved Method
1. Chemical Agent (Process Analysis)	LIC 1 LIC 2 MPF DFS	HRA Metals	TE-LOP-584,3010A/3050B, 6010B/6020/7470A and TE-LOP-557	One sample for analysis every 500 gallons of agent collected in the ACS Tanks.	Remote Agent Sampling System or Tap or Pipet
		Agent % Purity HRA Metals (Total) Agent Organic Impurities Agent Breakdown Products Density	TE-LOP-584 TE-LOP-584,3010A/3050B, 6010B/6020/7470A and TE-LOP-557 TE-LOP-584 TE-LOP-584 TE-LOP-574	One sample for analysis every fifth 500 gallons of agent collected in the ACS Tanks.	Tap or Pipet
		HRA Metals	3010A/3050B, 6010B/6020/7470A or TE-LOP-584	One sample for analysis collected in the ACS Tanks quarterly.	Tap or Pipet
2. Spent Decon Solution	LIC 1 and LIC 2 Secondary Chamber	" Agent Concentration " Total Organics Screen " Corrosivity (pH) " Specific Gravity	TE-LOP-572 TE-LOP-572 TE-LOP-574 (9040B) LOP 574	Each SDS-TANK	Tap
2'. Spent Decon Solution additional analysis (Organic Content > 5%)		" Ignitability " TCLP/HRA Metals (Total) " Total Organics	1020A, 1010 3010A, 6010B/7470A 5030B, 8260B 3510C/3520C, 8270C	Each SDS-TANK having an organic content greater than 5% by weight	Tap
3. Agent Collection System & Agent Quantification System Maintenance Residues	MPF	" Generator knowledge based on analytical results obtained from line item 2.2.1.1			
4. Metallic Agent Contaminated Debris: See Table 2-4 for the list of wastes	MPF	" Generator knowledge, composition of waste prevents a representative sample from being taken			

Table 2-0
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.1 WASTES REQUIRING ON-SITE TREATMENT

WASTE STREAM	TREATMENT UNIT(S)	ANALYTICAL PARAMETERS	ANALYTICAL METHODS[1]	FREQUENCY OF ANALYSIS (establish profile)	SAMPLING METHOD
5. Drained Bulk Containers/Projectiles	MPF	" Non-embedded metals (Appendix B)			
6. Energetic Munition Components	DFS	" Manufacturer Specifications (Appendix C)			
7. ECR Maintenance Residues (M55 Rocket Processing)	DFS	" Generator knowledge based on analytical results obtained from line items 2.2.1.1 and 2.2.1.6.			
ECR Maintenance Residues (Projectile Processing)	DFS	" Generator knowledge based on government manufacturer specifications			
8. Spent Activated Carbon from MDB HVAC & ACS-TANK Filter Systems	DUN	" Apparent Density " Iodine Number	TE-LOP-574 TE-LOP-574	Each batch[2] generated from each bank change-out: One core sample from each container comprising a batch, composited into one sample for analysis	Thief
9. Agent Contaminated Dunnage (TMA Generated)	DUN	" TCLP/HRA Metals (Total)	3050A, 6010A/7471A	Generator knowledge based on analytical results obtained from line item 2.2.2.20	
		" Total Organics	8260A, 3540B, 3541,		
10. Non-metallic Agent Contaminated Debris: PPE (Butyl Rubber) CAL Solid Waste (debris) MSB Solid Waste (debris) DAAMS Absorbent Tubes MDB Maintenance Equipment	DUN	Generator knowledge, composition of waste prevents a representative sample from being taken.			
11. PPE Respirator Canisters	DUN	Generator knowledge based on the waste generation location			
12. Spent Scrubber Brines (M55 Rocket Processing Spent)	BRA	" Agent Concentration " Corrosivity (pH) " Specific Gravity"	TE-LOP-572 TE-LOP-574 (9040B) LOP 574	Each BRA-TANK	Tap
		TCLP/HRA Metals (Total) " Total Organics " PCB	3050B, 6010B/7470A 5030B, 8260B 3510C/3520C, 8270C EPA 8082	Each M55 Rocket campaign or annually, whichever is shorter: One sample from first BRA-TANK generated for analysis	Tap
12.[1] Spent Scrubber Brines (All Other Campaigns)	BRA	" Agent Concentration " Corrosivity (pH)	TE-LOP-572 TE-LOP-574 (9040B) TE-LOP-574	Each BRA-TANK	Tap

Table 2-0
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.1 WASTES REQUIRING ON-SITE TREATMENT

WASTE STREAM	TREATMENT UNIT(S)	ANALYTICAL PARAMETERS	ANALYTICAL METHODS[1]	FREQUENCY OF ANALYSIS (establish profile)	SAMPLING METHOD
		" TCLP/HRA Metals (Total) " Total Organics	3050B, 6010B/7470A 5030B, 8260B 3510C/3520C, 8270C	Each agent/munition campaign or annually, whichever is shorter: One sample from first BRA-TANK generated for analysis	Tap
13. Miscellaneous Agent Contaminated Liquid Wastes	LIC 1 and LIC 2 Primary Chamber	" TCLP/HRA Metal (Total) " Screen (review of manufacturer's information) for organic constituents identified in Permit.	1311, 6010B/7470A	Once for every batch if collected in SDS tanks. Analysis to be completed prior to treatment.	SDS Tank Tap
				or as specified in item 2.2.2.22	or as specified in item 2.2.2.22
14. Bulk Containers Processed via Special Handling	MPF	HRA Metals (excluding Aluminum, Beryllium, Boron)	TE-LOP-541 or 3010A, or 6010B/7470A, or 6020	One sample for analysis of final rinse water from each bulk container processed by Special Handling System	Remote Sampling System or Coliwasa

Table 2-1
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.2 WASTES REQUIRING OFF-SITE TREATEDMENT/DISPOSAL

WASTE STREAM	GENERATION SOURCE	ANALYTICAL PARAMETERS	ANALYTICAL METHODS	FREQUENCY OF ANALYSIS (establish profile)	SAMPLING METHOD
1. LIC Slag	LIC 1 LIC 2	" TCLP Metals	1311, 6010B/7470A	Each batch[3] of containers: One sample form each container comprising a batch composited into one sample for analysis	Hammer and Chisel or Coring Device
2. Treated M55 Rocket Parts/Ash or the Treated Residue Stream from the Simultaneous Processing of GB M55 Rocket Parts/Ash and GB Projectiles in the DFS	DFS HDC	" Agent Concentration	TE-LOP-572	Each month throughout M55 rocket campaign: One grab sample from each HDC waste bin generated in an operational 12 hr shift, composited into one sample for analysis	Thief, Scoop or Coring Device
		" Agent Concentration " TCLP Metals " TCLP Organics[3] " PCB " PCDD/PCDF[4]	TE-LOP-572 1311, 6010B/7470A 1311, 8260B/8270C EPA 8082 8290	Each M55 rocket campaign or annually, whichever is shorter: One grab sample from each HDC waste bin generated in an operational 12 hr shift, composited into one sample for analysis	Thief, Scoop or Coring Device
3. Treated Burster & Fuse Bodies/Ash	DFS HDC	" TCLP Metals " TCLP Organics[3]	1311, 6010B/7470A 1311, 8260B/8270C	Each agent/munition campaign or annually, whichever is shorter: One grab sample from each HDC waste bin generated in an operational 12 hr shift, composited into one sample for analysis	Thief, Scoop or Coring Device
4. Treated VX Fuse & Mine Bodies/Ash	DFS HDC	" Agent Concentration	TE-LOP-572	Each month throughout each munition campaign: One grab sample from each HDC waste bin generated in an operational 12 hr shift, composited into one sample for analysis	Thief, Scoop or Coring Device
		" Agent Concentration " TCLP Metals " TCLP Organics[3]	TE-LOP-572 1311, 6010B/7470A 1311, 8260B/8270C	Each agent/munition campaign or annually, whichever is shorter: One grab sample from each HDC waste bin generated in an operational 12 hr shift, composited into one sample for analysis	Thief, Scoop or Coring Device
5. DFS PAS Cyclone Residue (Generated from M55 Rockets)	DFS	" Agent Concentration	TE-LOP-572	Throughout M55 rocket campaign: One core sample for analysis from each from each container generated	Thief or Coring Device
		" TCLP Metals " TCLP Organics[3] " PCB " PCDD/PCDF[4]	1311, 6010B/7470A 1311, 8260B/8270C EPA 8082 8290	Each M55 rocket campaign or annually, whichever is shorter: First batch of containers, one grab sample from each container comprising a batch, composited into one sample for analysis	Thief or Coring Device

Table 2-1
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.2 WASTES REQUIRING OFF-SITE TREATEDMENT/DISPOSAL

WASTE STREAM	GENERATION SOURCE	ANALYTICAL PARAMETERS	ANALYTICAL METHODS	FREQUENCY OF ANALYSIS (establish profile)	SAMPLING METHOD
5'. DFS PAS Cyclone Residues (All Other Campaigns)	DFS	" Agent Concentration	TE-LOP-572	Throughout each agent/munition campaign: one core sample for analysis from each container generated	Thief or Coring Device
		" TCLP Metals " TCLP Organics[3]	1311, 6010B/7470A 1311, 8260B/8270C	Each agent/munition campaign or annually, whichever is shorter: First batch of containers, one core sample from each container comprising a batch, composited into one sample for analysis	Thief or Coring Device
6. Treated Munition Casings & Bulk Containers	MPF	" Chemical Agent	See Section 2.2.2.6	Each Burn Tray: Monitor	ACAMS
7. MPF Treated Debris: Table 4-2 waste residues	MPF	" Chemical Agent " Generator knowledge, composition of waste prevents a representative sample from being taken	See Section 2.2.2.6	Each Burn Tray: Monitor	ACAMS
8. MPF Burn Tray Residues	MPF	" Agent Concentration " TCLP Metals " TCLP Organics[3]	TE-LOP-572 1311, 6010B/7470A 1311, 8260B/8270C	Each agent/munition campaign or annually, whichever is shorter: One core sample from one container for analysis	Thief or Coring Device
9. DUN Debris/Ash	DUN Ash Gate	" Agent Concentration	TE-LOP-572	ach waste type mini campaign: One grab sample first five consecutively generated DUN Ash Gate waste bins composited into one sample for analysis	Thief, or Scoop
		" TCLP Metals " TCLP Organics[3] " PCDD/PCDF[4]	1311, 6010B/7470A 1311, 8260B/8270C 8290	Each waste type mini campaign: One grab sample from five consecutively generated DUN Ash Gate waste bins composited into one sample for analysis	Thief, or Scoop
10. DUN PAS Baghouse Ash	DUN PAS	" Agent Concentration	TE-LOP-572	Each container: One core sample for analysis	Thief or Coring Device
		" TCLP Metals " TCLP Organics[3] " PCDD/PCDF[4]	1311, 6010B/7470A 1311, 8260B/8270C 8290	Each waste type mini campaign: One grab sample from first DUN-PAS Baghouse bin generated for analysis	Thief or Coring Device
11. Incinerator Refractory	LIC 1 LIC 2 MPF DFS DUN	" TCLP Metals	1311, 6010B/7470A	Each chamber change out: One grab sample from 10% of the containers comprising a batch, composited into one sample for analysis	Hammer and Chisel or Coring Device

Table 2-1
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.2 WASTES REQUIRING OFF-SITE TREATEDMENT/DISPOSAL

WASTE STREAM	GENERATION SOURCE	ANALYTICAL PARAMETERS	ANALYTICAL METHODS	FREQUENCY OF ANALYSIS (establish profile)	SAMPLING METHOD
12. PAS Residues (M55 Rocket Processing)	DFS PAS	" Agent Concentration " Corrosivity (pH)	TE-LOP-572 TE-LOP-574 (9040B)	Each container: One core sample for analysis	Trier or Coring Device
		" Free Liquids " TCLP Metals " TCLP Organics[3] " PCB	TE-LOP-574 (9095) 1311, 6010B/7470A 1311, 8260B/8270C EPA 8082	Each M55 rocket campaign or annually, whichever is shorter: One core sample from one container for analysis	Trier or Coring Device
12'. PAS Residues (All Other Campaigns)	DFS PAS LIC 1 PAS LIC 2 PAS MPF PAS	" Agent Concentration " Corrosivity (pH)	TE-LOP-572 TE-LOP-574 (9040B)	Each container: One core sample for analysis	Trier or Coring Device
		" Free Liquids " TCLP Metals " TCLP Organics[3]	TE-LOP-574 (9095) 1311, 6010B/7470A 1311, 8260B/8270C	Each agent/munition campaign or annually, whichever is shorter: Each PAS system, one core sample from first container generated for analysis	Trier or Coring Device
13. Spent Scrubber Brines (M55 rocket processing)	DFS PAS LIC 1 PAS LIC 2 PAS MPF PAS	" Agent Concentration " Corrosivity (pH) " Specific gravity	TE-LOP-572 TE-LOP-574 (9040B) TE-LOP-574	Each BRA-TANK: One sample for analysis, if sample is collected from BRA-TANK	Tap
		" Agent Concentration " Corrosivity (pH) " Specific Gravity	TE-LOP-572 TE-LOP-574 (9040B) LOP 574	Each tanker: One sample for analysis, if sample is collected from tanker	Coliwasa or Bailer
		" TCLP Metals " TCLP Organics[3] " PCB " TDS " TSS	1311, 6010B/7470A 1311, 8260B/8270C EPA 8082 EPA 160.1 EPA 160.2	Each M55 rocket campaign or annually, whichever is shorter: One sample for analysis from either first BRA-TANK or tanker generated, depending on the accumulation vessel.	Tap, Coliwasa or Bailer depending on sample location
13'. Scrubber Brines (All Other Campaigns)	DFS PAS LIC 1 PAS LIC 2 PAS MPF PAS	" Agent Concentration " Corrosivity (pH) " Specific Gravity	TE-LOP-572 TE-LOP-574 (9040B) LOP 574	Each BRA-TANK: One sample for analysis, if sample is collected from BRA-TANK	Tap
		" Agent Concentration " Corrosivity (pH) " Specific Gravity	TE-LOP-572 TE-LOP-574 (9040B) LOP 574	Each full tanker: One sample for analysis, if sample is collected from tanker	Coliwasa or Bailer
		" TCLP Metals " TCLP Organics[3] " TDS " TSS	1311, 6010B/7470A 1311, 8260B/8270C EPA 160.1 EPA 160.2	Each agent/munition campaign or annually, whichever is shorter: One sample for analysis	Tap, Coliwasa, or Bailer depending on sample location
14. SDS-TANK Sludge	SDS-TANK	" Agent Concentration " Corrosivity (pH) " Free Liquids " TCLP Metals " TCLP Organics[3]	TE-LOP-572 TE-LOP-574 (9040B) TE-LOP-574 (9095) 1311, 6010B/7470A 1311, 8260B/8270C	Each agent/munition campaign or annually, whichever is shorter: One core sample from first container generated for analysis	

Table 2-1
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.2 WASTES REQUIRING OFF-SITE TREATEDMENT/DISPOSAL

WASTE STREAM	GENERATION SOURCE	ANALYTICAL PARAMETERS	ANALYTICAL METHODS	FREQUENCY OF ANALYSIS (establish profile)	SAMPLING METHOD
15. BRA-TANK Sludges	BRA-TANK	" Agent Concentration " Corrosivity (pH) " Free Liquids " TCLP Metals " TCLP Organics[3]	TE-LOP-572 TE-LOP-574 (9040B) TE-LOP-574 (9095) 1311, 6010B/7470A 1311, 8260B/8270C	Each agent/munition campaign or annually, whichever is shorter: One core sample from first container generated for analysis	Trier or Coring Device
16 PAS Demister Candle Sleeves (M55 rocket processing)	DFS PAS	" Agent Concentration	TE-LOP-572	Each change out: One grab sample from 10% of the drums comprising a batch composited into one sample for analysis	Determined worse case section cut sleeve
		" TCLP Metals " TCLP Organics[3] " PCB	1311, 6010B/7470A 1311, 8260B/8270C EPA 8082	Each M55 Rocket campaign or annually, which ever is shorter: One grab sample from 10% of the drums comprising first batch generated, composited into one sample for analysis	Determined worse case section cut sleeve
16'. PAS Demister Candle Sleeves (All Other Campaigns)	DFS PAS LIC 1 PAS LIC 2 PAS MPF PAS	" Agent Concentration	TE-LOP-572	Each change out: One grab sample from 10% of the drums comprising a batch composited into one sample for analysis	Determined worse case section cut sleeve
		" TCLP Metals " TCLP Organics[3]	1311, 6010B/7470A 1311, 8260B/8270C	Each agent/munition campaign or annually, which ever is shorter: One grab sample from 10% of the drums comprising first batch generated, composited into one sample for analysis	Determined worse case section cut sleeve
17. Scrubber Brine Salts (M55 Rocket Processing)	" BRA-DDYR	" Corrosivity (pH) " Free Liquids " TCLP Metals " TCLP Organics[3] " PCB	TE-LOP-574 (9040B) TE-LOP-574 (9095) 1311, 6010B/7470A 1311, 8260B/8270C EPA 8082	Each M55 rocket campaign or annually, whichever is shorter: One core sample from each BRA-DDYR salt bin generated in an 12 hr operational shift, composited into one sample for analysis	Trier or Coring Device
17'. Scrubber Brine Salts (All Other Campaigns)	" BRA-DDYR	" Corrosivity (pH) " Free Liquids " TCLP Metals " TCLP Organics[3]	TE-LOP-574 (9040B) TE-LOP-574 (9095) 1311, 6010B/7470A 1311, 8260B/8270C	Each agent/munition campaign or annually, whichever is shorter: One core sample from each BRA-DDYR salt bin generated in an 12 hr operational shift, composited into one sample for analysis	Trier or Coring Device
18. BRA PAS Knockout Box Residues (M55 Rocket Processing)	" BRA-PAS	" Corrosivity (pH) " Free Liquids " TCLP Metals " TCLP Organics[3] " PCB	TE-LOP-574 (9040B) TE-LOP-574 (9095) 1311, 6010B/7470A 1311, 8260B/8270C EPA 8082	Each M55 rocket campaign or annually, whichever is shorter: one core sample from BRA-PAS Knockout Box salt bin for analysis	Trier or Coring Device
18'. BRA PAS Knockout Box Residues (All Other Campaigns)	" BRA-PAS	" Corrosivity (pH) " Free Liquids " TCLP Metals " TCLP Organics[3]	TE-LOP-574 (9040B) TE-LOP-574 (9095) 1311, 6010B/7470A 1311, 8260B/8270C	Each agent/munition campaign or annually, whichever is shorter: One core sample from BRA-PAS Knockout Box salt bin for analysis	Trier or Coring Device

Table 2-1
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.2 WASTES REQUIRING OFF-SITE TREATEDMENT/DISPOSAL

WASTE STREAM	GENERATION SOURCE	ANALYTICAL PARAMETERS	ANALYTICAL METHODS	FREQUENCY OF ANALYSIS (establish profile)	SAMPLING METHOD
19. BRA PAS Baghouse Residues (M55 Rocket Processing)	" BRA-PAS	" Corrosivity (pH) " Free Liquids " TCLP Metals " TCLP Organics[3] " PCB	TE-LOP-574 (9040B) TE-LOP-574 (9095) 1311, 6010B/7470A 1311, 8260B/8270C EPA 8082	Each M55 rocket campaign or annually, whichever is shorter: One core sample from first four consecutively generated BRA-PAS Baghouse salt bins, composited into one sample for analysis.	Trier or Coring Device
19'. BRA PAS Baghouse Residues (All Other Campaigns)	" BRA-PAS	" Corrosivity (pH) " Free Liquids " TCLP Metals " TCLP Organics[3]	TE-LOP-574 (9040B) TE-LOP-574 (9095) 1311, 6010B/7470A 1311, 8260B/8270C	Each agent/munition campaign or annually, whichever is shorter: 1 core sample from first four consecutively generated BRA-PAS Baghouse salt bins, composited into one sample for analysis.	Trier or Coring Device
20. UPA generated Dunnage (M55 Rockets Processing)	UPA	" Chemical Agent	TE-LOP-572	Each rocket campaign or annually, whichever is shorter: one sample for analysis from first 15 On-site Containers unpackaged	Wood plane to collect shavings form dunnage surface/ discolored or stained areas selected for sampling
		" TCLP Metals " TCLP/HRA Metals (Total) " TCLP Organics[3] " Total Organics " PCB	1311, 6010B/7470A 3050A, 6010B/7471A 1311, 8260B/8270C 3540C or 3541, 8260B/8270C EPA 8082	Each rocket campaign change or annually, whichever is shorter: One sample from first 15 On-site Containers unpackaged composited into one sample for analysis	Wood plane to collect shavings form dunnage surface/ discolored or stained areas selected for sampling
20'. UPA generated Dunnage (All Other Campaigns)	UPA	" Chemical Agent	TE-LOP-572	Each agent/munition campaign or annually, whichever is shorter: one sample for analysis from first 15 On-site Containers/shipping containers unpackaged	Wood plane to collect shavings form dunnage surface/ discolored or stained areas selected for sampling

Table 2-1
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.2 WASTES REQUIRING OFF-SITE TREATEDMENT/DISPOSAL

WASTE STREAM	GENERATION SOURCE	ANALYTICAL PARAMETERS	ANALYTICAL METHODS	FREQUENCY OF ANALYSIS (establish profile)	SAMPLING METHOD
		" TCLP Metals " TCLP/HRA Metals (Total) " TCLP Organics[3] " Total Organics	1311, 6010B/7470A 3050B, 6010B/7471A 1311, 8260B/8270C 3540C, 3541, 8260B/8270C	Each agent/munition campaign or annually, whichever is shorter: One sample from first 15 On-site Containers/shipping containers unpackaged composited into one sample for analysis	Wood plane to collect shavings form dunnage surface/ discolored or stained areas selected for sampling
21. DPE Suits	MDB	" Chemical Agent	TE-LOP-572	For DPE suits exclusively contaminated with chemical agent vapors, one sample from 10% of the DPE suits generated	Piece cut from DPE suit front mid-section
22. Spent Hydraulic Fluid when treated off-site	MDB	" Agent Concentration " TCLP Metals " TCLP Organics[3]	TE-LOP-572 1311, 6010B/7470A 1311, 8260B 3580A, 8270C	Each batch: One sample each from 10% of the drums comprising a batch, composited into one sample for analysis	Coliwasa
23. Spent Lubricating Oil when treated off-site	MDB	" Agent Concentration " TCLP Metals " TCLP Organics[3]	TE-LOP-572 1311, 6010B/7470A 1311, 8260B 3580A, 8270C	Each batch: One sample each from 10% of the drums comprising a batch, composited into one sample for analysis	Coliwasa
24. CAL Aqueous Waste	CAL	" Agent Concentration " Corrosivity (pH)	TE-LOP-572 TE-LOP-574 (9040B)	Each container: One sample for analysis	Coliwasa
		" Ignitability " TCLP Metals " TCLP Organics[3]	1020 6010B/7470A 8260B 3580A, 8270C	Each agent/munition campaign or annually, whichever is shorter: One sample from first container generated for analysis	Coliwasa
25. CAL Solid Wastes (debris)	CAL	" Chemical Agent	TE-LOP-572	Each container: One sample of the decon solution collected at the bottom of the accumulation container taken for analysis	Coliwasa
26. MSB Solid Waste (debris)	MSB	" Chemical Agent	TE-LOP-572	Each container: One sample of the decon solution collected at the bottom of the accumulation container taken for analysis	Coliwasa
27. Sump 110	Sump 110	" Agent Concentration " TCLP Metals " TCLP Organics[3] " TDS	TE-LOP-572 1311, 6010B/7470A 1311, 8260B/8270C EPA 160.1	Each full tanker: One sample	Coliwasa

Table 2-1
TOCDF WASTE ANALYSIS PLAN SUMMARY

2.2.2 WASTES REQUIRING OFF-SITE TREATEDMENT/DISPOSAL

WASTE STREAM	GENERATION SOURCE	ANALYTICAL PARAMETERS	ANALYTICAL METHODS	FREQUENCY OF ANALYSIS (establish profile)	SAMPLING METHOD
28. Spent Decontamination Solution	SDS	" Agent Concentration " TC Metals " Total Organics[3] " pH " Specific Gravity " Total Halogens " BTU " Explosives " Ignitability	TE-LOP-572 6010B//3010A7470A 8260B, 3510C, 8270C TE-LOP-574 (9040B) LOP 574 9056 ASTM D240-87 8330/8332 1010, 1020A	Each SDS Tank-101, 102 and 103	Tap
28'. Spent Decontamination Solution	SDS	" Agent Concentration " pH " Specific Gravity	TE-LOP-572 TE-LOP-574 (9040B) TE-LOP 574	Each 90-day SDS Tank	Tap
29. Solid Residues from Special Handling Conditioning and Settling System (CSS)	CSS	Agent Concentration TCLP Metals TCLP Organics[3]	TE-LOP-572 1311, 6010B/7470A 1311, 8260B/8270C	One sample from each container generated during a CSS clean-out event, combined into one sample for analysis	Trier or Scoop
30. Bulk Containers Failing Special Handling Process (SHP)	SHP	Agent Concentration pH	TE-LOP-572 TE-LOP-574 (9040B)	One sample for analysis from each container failing special handling.	Remote Sampling System or Coliwasa
		TCLP Metals TCLP Organics[3]	1311, 6010B/7470A 1311, 8260B/8270C	One sample for analysis from each container failing special handling if solids remain in the container	Trier or Scoop

Footnotes:
1. The annotated methods identified are to be used. When EPA approves new promulgated methods, TOCDF will notify the laboratory of the required change and request a time frame of when the change will occur. The laboratory will have 6 months to submit documentation to TOCDF of the change or a time frame when the change will be completed. The laboratory must use the most promulgated method within one year of promulgation. If that is not possible, a written request for extension must be provided to DSHW for approval.
2. A batch is defined as all the drums (or containers) of waste generated from the same event, at the same location.
3. TCLP organics are defined as those compounds described by 40 CFR 261.24 by the waste codes D018, D019, D021, D022, D023, D024, D025, D026, D027, D028, D029, D030, D032, D033, D034, D035, D036, D037, D038, D039, D040, D041, and D042.
4. Dioxins (PCDDs) and Furans (PCDFs) are additionally analyzed for only if waste isToxicity Characteristic for organics.

Table 2-2:
Potential Site-Generated Waste Streams (Based Upon JACADS Analytical Results)

Waste Stream	Description	EPA Waste Code	Utah Waste Code
MPF Metal	Metal parts after incineration.	N/A	F999
MPF Residue	MPF maintenance residue.	D006, D008	F999
LIC Slag (non-haz)	Slag generated in LIC secondary chamber.	N/A	F999
LIC Slag (hazardous)	Slag generated in LIC secondary chamber.	D007	F999
LIC Refractory (hazardous)	Produced during refractory changeout.	D007	F999
LIC Refractory (non-haz)	Produced during refractory changeout.	N/A	F999
DUN Refractory	Produced during refractory changeout.	N/A	F999
DUN Baghouse Residue (hazardous)	Residue collected from baghouse.	D006, D007, D008	F999
DUN Baghouse Residue (non-haz)	Residue collected from baghouse.	N/A	F999
DUN Ash	Produced during the incineration of dunnage.	N/A	F999
DFS HDC Ash (hazardous)	Produced during the incineration of munitions.	D006, D008	F999
DFS HDC Ash (non-haz)	Produced during the incineration of munitions.	N/A	F999
DFS Cyclone Residue	Produced during the incineration of munitions.	D006, D007, D008	F999
DFS Refractory	Produced during refractory changeout.	N/A	F999
Brine Salts (hazardous)	Produced during the drying of scrubber brine.	D006, D007, D008	F999
Brine Salts (non-haz)	Produced during the drying of scrubber brine.	N/A	F999
Brine Tank Sludge (hazardous)	Produced during the cleanout of tanks that store scrubber brine.	D006, D007, D008	F999
Brine Tank Sludge (non-haz)	Produced during the cleanout of tanks that store scrubber brine.	N/A	F999
BRA Baghouse Residue (non-haz)	Residue collected from baghouse.	N/A	F999
BRA Baghouse Residue (hazardous)	Residue collected from baghouse.	D006, D007, D008	F999
Waste Citric Acid	Generated during the cleaning of the brine reduction evaporators and PAS.	D006, D007	F999
Waste Hydrochloric Acid	Generated during the cleaning of the brine reduction evaporators and PAS.	D006, D007	F999
Demister Filters (non-haz)	Produced during the changeout of demister filters.	N/A	F999
Demister Filters (hazardous)	Produced during the changeout of demister filters.	D006, D008	F999
PAS Quench Tower Residue (non-haz)	Produced during the cooling of the off-gas.	N/A	F999
PAS Sump Sludge (hazardous)	Generated during the cleanout of the PAS sumps.	D005, D006, D007, D008, D011	F999
PAS Sump Sludge (non-haz)	Generated during the cleanout of the PAS sumps.	N/A	F999
RHA Baghouse Residue	Residue collected from baghouse.	D006, D008	F999
Decontamination- Neutralization Solutions	Produced from site decontamination and laboratory operations.	D002, D008, D018, D022, F002, F003, F005	F999
Waste Heavy Metal Solution - Acidic, Oxidizing	Generated at the Laboratory.	D001, D002, D004, D006, D007, D008, D009, D010	F999
Waste Acid Solution	Generated at the Laboratory.	D002	F999

Table 2-2:
Potential Site-Generated Waste Streams (Based Upon JACADS Analytical Results)

Waste Stream	Description	EPA Waste Code	Utah Waste Code
Waste Organic Solvents	Generated at the Laboratory.	D001, F002, F003, F005	F999
DPE Suits (3X)	Generated during toxic operations.	N/A	F999
Wood Pallets (non-haz)	Produced during the unpacking of ONCs and munitions.	N/A	F999
Spent Activated Carbon (non-haz, 3X)	Produced during the changeout of carbon filters.	N/A	F999
Miscellaneous Metal Parts	Worn out equipment and parts.	D006, D008	F999
Clean-up Materials (non-haz)	Miscellaneous materials generated during the decontamination and maintenance of the plant.	N/A	F999
Incinerator Byproducts	Byproducts from maintenance activities.	D007	F999
Spent Hydraulic Fluid (non-haz)	Produced during maintenance activities.	N/A	N/A
Waste Oil (non-haz)	Produced during maintenance activities.	N/A	N/A
Waste Oil	Produced during maintenance activities.	F001, F002	F999
Waste Paint Liquids	Produced during maintenance activities.	D001, D005, D007, D008, F002, F003, F005	F999
Waste Paint Solids	Produced during maintenance activities.	D007, D008, F002, F003, F005	F999
Spill Cleanup Materials (non-haz)	Generated during single substance spill response cleanup.	N/A	F999
Trash, Debris, & PPE	Produced during maintenance activities.	N/A	F999

Table 2-3:
Analytical Method Descriptions

Method	Description/Title
SW-846 1010	Pensky – Martens Closed-Cup Method for Determining Ignitability
SW-846 1020A	Setaflash Closed-Cup Method for Determining Ignitability
SW-846 1311	Toxicity Characteristic Leaching Procedure.
SW-846 3010A	Acid Digestion of Aqueous Samples and Extracts for Total Metals for Analysis by FLAA or ICP Spectroscopy.
SW-846 3050B	Acid Digestion of Sediments, Sludges, and Soils.
SW-846 3510C	Separatory Funnel Liquid-Liquid Extraction.
SW-846 3520C	Continuous Liquid-Liquid Extraction.
SW-846 3541	Automated Soxhlet Extraction
SW-846 3540C	Soxhlet Extraction
SW-846 3580A	Waste Dilution.
SW-846 5030B	Purge and Trap
SW-846 6010B	Inductively Coupled Plasma - Atomic Emission Spectroscopy.
SW-846 6020	Inductively Coupled Plasma-Mass Spectrometry
SW-846 7470A	Mercury in Liquid Waste (Manual Cold-Vapor Technique).
SW-846 7471A	Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique)
SW-846 8082	Polychlorinated Biphenyls (PCBs) by Capillary Colunn Gas Chromatography
SW-846 8260B	Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Column Technique.
SW-846 8270C	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS): Capillary Column Technique.
SW-846 8290	Polychlorinated Dibenzodioxins (PCDDs) and Ploychlorinated Dibenzofurans (PCDFs) by High Resolution Gas Chromatorgraphy/High-Resolution Mass Spectrometry (HRGC/HRMS)
SW-846 8330	Nitroaromatics and Nitramines by High Performance Liquid Chromatography (HPLC)
SW-846 8332	Nitroglycerine by High Performance Liquid Chromatography
SW-846 9040B	pH Electrometric Measurement.
SW-846 9095	Paint Filter Liquids Test
EPA 160.1	Total Dissolved Solids (TDS).
EPA 160.2	Total Suspended Solids (TSS).
TE-LOP-557	Analysis of Metals by Inductively Coupled Plasma-Mass Spectrometry (ICP-MS)
TE-LOP-572	Extractions/Analyses Including: DWS Extraction of GB for the Metals Diluent Solution; DWS Extraction of VX and HD; Extraction of GB, HD, and VX from Hydraulic Fluid; Carbon Capacity by Iodine Number; Analysis of GB, HD, and VX in Lubricating Oils; Analysis of GB, HD, and VX in Organic Wastes; and Extraction of GB, HD, and VX from Wood.
TE-LOP-574	Special Analyses Including Determination of Apparent Density of Activated Charcoal and Specific Gravity Measurements.
TE-LOP- 541	Analysis of Agent and Bulk Container Special Handling Rinsate using X-ray Fluorescence Spectroscopy
TE-LOP-584	Neat Agent Opertions and Gas Chromatographic Determination of Concentration of Agent Concentration.

Table 2-4
Agent Contaminated Waste That May Be Treated in The MPF

Waste Stream and Quantity (if Applicable)	**Waste Code**(s)
Assorted Parts/Material Conveyors Chains, Rollers, Links Gears, Bearings, Bushings Wheels, Idlers GearboxesGasket Materials (non-combustible) Seals (non-combustible) Carbon Adsorber Trays (from which carbon has been removed) Collets Drain Probes Crimp Jaws and Pins Bore Station Blades Turntable Projectile Bushings Projectile Pickup Heads Shear Blades Punches Pusher Assemblies Paper, Cloth, Pads, Pillows, Spill Absorbents(Cellulose/polyproplylene) (Maximum, 28 lbs/charge for a single charge at 20,000 BTU/lb at 1450°F) (Maximum 16 lbs/charge for consecutively charged trays containing paper, cloth, pads, pillows and spill absorbents, at 20,000 BTU/lb at 1450°F) Jaw Gripper Assemblies Projectile Cans Hoists	P999[1]
Electrical Components Motors Conduit (Metal) Solenoids Switches (Safety, Limit, Light Light Fixtures, maximum of 20 units per furnace charge	P999[1]
Plumbing Materials Pumps Piping/Fittings/Tubing (metal) Chemical Seals Hydraulic Motors Hydraulic Cylinders Hydraulic Tubing/Fittings (metal) Hydraulic Hose/Fittings (metal) Pressure Regulators Flow Control Valves	P999[1]

Table 2-4
Agent Contaminated Waste That May Be Treated in The MPF

Waste Stream and Quantity (if Applicable)	**Waste Code**(s)
Pneumatic Actuators Accumulator Bladders Filter Cartridges/Elements and associated residue/cleanup material (includes AQS/ACS filter elements) Spray Nozzles Pipe GasketsValves (Hand, Solenoid, Agent, Decon, Hydraulic)	
Instrumentation Test Equipment (Meters, Gauges, Etc.) Sensors, Transmitters and Transducers Flow, Pressure and Proximity Switches Pressure GaugesCameras or Camera Parts Load Cells Speakers Low Volume Agent Samplers Thermolcouples and Thermolwells	P999[1]
Assorted Solids Hand Tools Grating Metal Buckets, Pans, and Barrels Metal Brackets, Stands, Fixtures, Etc. Escape Air Tank, Mask, and Regulators Scrub Brushes Banding Material Empty Overpacks/Drums (Non-Combustible) Monitoring Sample Probes (DAAMS Tubes, etc.) Silicone material/parts Glassware Plaster Paint Brushes, Rollers, and Pans Empty Paint and Lubricant Spray Cans (Punched), maximum 25 units per furnace charge Personal Protective Equipment (non-combustible) DPE Leather Over Garments, maximum 10 units per furnace charge Plastic bags used to contain contaminated wastes, a maximum of 1.0 lb per furnace charge	P999[1]
[1] In addition to the P999 waste code, the above-mentioned waste streams may carry the following waste codes: D002, D004, D006, D007, D008, D009, and D010.	

Table 2-A-1
CHEMICAL AGENT PHYSICAL PROPERTIES

PROPERTY	GB	VX	H	HD	HT
Chemical Name	Isopropyl methyl-phosphonofluoridate (Sarin)	O-ethyl S-(2-diisopropyl-amino ethyl) methylphosphonothiolate	Same as HD with up to 25% impurities	Bis(2-chlorethyl) sulfideor 2.2'-dichlorodiethyl sulfide (sulfur mustard)	Same as HD with 40% T Bis[2(-chloroethylthio) ethyl] ether
Chemical formula	$C_4H_{10}FO_2P$	$C_{11}H_{26}NO_2PS$	$C_4H_8Cl_2S_{1.5}$	$C_4H_8Cl_2S$	$C_{5.15}H_{10.3}Cl_{2.0}O_{0.29}S_{1.29}$
Molecular weight	140.0951	267.37262	175.11016	159.07816	189.14764
Vapor specific gravity (air = 1.00)	4.86	9.2	5.4	5.4	6.92
Liquid density at 77°F[1] (lb/ft^3)	67.965	62.93	79.49	79.49	79.49
Freezing point (°F)	-69	Below -60	41 to 57	58	32 to 34.3
Boiling Point (°F)	316	572	437	423	442
Vapor pressureat 77°F[1]mm/Hg)	2.9	0.00066	0.059	0.072	0.104
Flash Point (°F)	Does not flash	318	212	221	212
Viscosity (centistokes) at 77°F [1]	1.28	9.96 (pure); may be substantially higher if partially decomposed	3.95	3.95	6.05
Color	Clear to straw to amber	Clear to straw	Amber-dark brown liquid		
Odor	None	None	Garlic		
Special properties	None		Permeates ordinary rubber		
Solubility properties	Miscible with water and readily soluble in all organic solvents	Best solvents are dilute mineral acids	Water (distilled), 0.092 g/100 cc at 72°F; completely soluble in acetone, CCl_4,CH_3Cl, tetrachloroethane, ethyl benzoate, ether)		
High heating value (Btu/lb at 60°F)	10073	15174	8100	8500	9,400
Physical state	Viscous liquid				

[1] Agents H, HD, and HT are at 68°F.

Table 2-A-2
CHEMICAL AGENT COMPOSITION[2]

AGENT	CHEMICAL CONSTITUENT	RANGE (neat agent wt. percent)
GB	**Isopropyl methyl phosphonofluoridate**	**Ton Containers: 38.8 - 92.6** **155 mm Projectiles: 59.6 - 88.0** **105 mm Projectiles: 64.3 - 80.1** **MC1 Bomb: 76.3 - 92.5** **M55 Rockets: 77.2 to 93.1** **MK-116 Bomb: 88.8 - 92.1**
	N,N'-Diisopropylcarbodiimide	0.0 - 1.5
	Tributylamine	0.0 - 10.5
	Methylphosphonofluoridic acid	0.0 - 10.5
	Diisopropyl methylphosphonate	0.7 - 10.3
	Methylphosphonic difluoride	0.0 - 1.1
	2-Propanol	0.1 - 1.1
VX	**O-ethyl, S-2-diisopropylaminoethyl) methylphosphonthiolate**	**Ton Containers: 27.1 - 98.5** **M23 Mine: 72.4 - 90.5** **155 mm Projectiles: 72.4 - 93.8** **TMU28 (Spray Tank): 93.3 - 97.7** **Other Items: 91 - 94.8**
	P,P'-Diethyl P,P'dimethyldiphosphonate	2.0 - 5.0
	2-Diisopropylaminoethanethiol	0.3 - 1.3
	bis(2-Diisopropylaminoethyl) disulfide	0.1 - 1.1
	O,O'-bis(Diisopropylaminoethyl) methylphosphonite	0.7 - 1.4
	S,S'-bis(Diisopropylaminoethyl) methyphosphonodithioate	0.2 - 3.6
	N,N'-Dicyclohexylcarbodiimide	2.2 - 3.6
	N,N'-Diisopropylcarbodiimide	1.1 - 2.5
HD[3]	**Bis (2-chloroethyl) sulfide**	**Ton Containers: 50.5 - 97.0** **Other Items: 50 - 92**
	1,2-Bis(2-chloroethylthio)ethane	4.0 - 4.7
	Bis[2-(2-chloroethylthio)ethyl]ether	5.0
	1,2,-Dichloroethane	2.4
	1-(2-Chloroethoxy)-2-(2-chloroethylthio)ethane	1.0
	2-Chloroethyl ?-chlorobutyl sulfide (mixed isomers)	2.0

[1] Data Sources: CAMDS Records, SUPPLECAM, and Edgewood.

[2] H and HT contain the same active ingredient and impurities shown for HD but in different proportions. HD contains the highest weight percent of the active ingredient bis (2-choroethyl) sulfide.

TABLE 2-A-3
GB AGENT PURITY

Munition	Agent Lot	Purity	Metals	Source
105mm Projectile	RM6651-312	64.30%		SUPLECAM
105mm Projectile	RM6651-310	65.80%		SUPLECAM
105mm Projectile	RM6651-309	68.50%		SUPLECAM
105mm Projectile	RM6651-310	68.50%	FE<200, CU<200, NI<200, AL<200	SUPLECAM
105mm Projectile	RM6655-309	68.50%	FE<200, CU<200, NI<200, AL=445	SUPLECAM
105mm Projectile	RM6655-309	68.50%	FE<200, CU<200, NI<200, AL=445	SUPLECAM
105mm Projectile	RM6651-313	70.10%		SUPLECAM
105mm Projectile	RM6651-236	70.20%		SUPLECAM
105mm Projectile	RM6651-236	70.20%	FE<200, CU<200, NI<200, AL<200	SUPLECAM
105mm Projectile	RM76039-323	70.20%		SUPLECAM
105mm Projectile	RM76039-409	70.60%		SUPLECAM
105mm Projectile	RM76038-425	71.20%		SUPLECAM
105mm Projectile	RM76039-376	73.30%		SUPLECAM
105mm Projectile	RM6651-316	73.60%		SUPLECAM
105mm Projectile	RM76039-389	76.20%		SUPLECAM
105mm Projectile	RM76039-335	76.80%		SUPLECAM
105mm Projectile	RM76039-333	78.30%		SUPLECAM
105mm Projectile	RM6651-234	79.40%		SUPLECAM
105mm Projectile	RM76039-390	80.10%		SUPLECAM
	MAX	80.10%		
	MIN	64.30%		
	AVG	71.81%		
	SDEV	4.39%		
Mk-116 Weteye	RMA-2-3	88.80%	FE=1.79, CU=0.17, NI=BDL, AL=22.1	SUPLECAM
Mk-116 Weteye	RMA-2-1	89.80%	FE=1.33, CU=0.20, NI=.35, AL=31.2	SUPLECAM
Mk-116 Weteye	RMA-2-2	90.30%	FE=1.55, CU=0.13, NI=BDL, AL=14.2	SUPLECAM
Mk-116 Weteye	RMA-2-4	92.10%	FE=1.64, CU=0.15, NI=BDL, AL=14.7	SUPLECAM
	MAX	92.10%		
	MIN	88.80%		
	AVG	90.25%		
	SDEV	1.20%		
155mm Projectile	RM76039-320	59.60%		SUPLECAM
155mm Projectile	RM6651-224	68.00%		SUPLECAM
155mm Projectile	RM86039-428	68.80%		SUPLECAM
155mm Projectile	RM86039-427	70.20%		SUPLECAM
155mm Projectile	RM6651-310	73.30%		SUPLECAM
155mm Projectile	RM86039-430	74.00%		SUPLECAM
155mm Projectile	RM86029-430	74.30%		SUPLECAM
155mm Projectile	RM86039-429	74.30%		SUPLECAM
155mm Projectile	RM6651-242	74.50%		CAMDS
155mm Projectile	RM5651-211	74.90%		SUPLECAM
155mm Projectile	RM86039-426	75.30%		SUPLECAM
155mm Projectile	RM86039-424	76.00%		SUPLECAM
155mm Projectile	RM86039-429	76.50%		SUPLECAM
155mm Projectile	RM6651-243	76.60%	FE=4624, CU=BDL, FI=BDL, AL=BDL	SUPLECAM

TABLE 2-A-3
GB AGENT PURITY

Munition	Agent Lot	Purity	Metals	Source
155mm Projectile	RM76039-376	76.60%		SUPLECAM
155mm Projectile	RM86038-409	78.20%		SUPLECAM
155mm Projectile	RM86039-428	78.20%		SUPLECAM
155mm Projectile	RM5651-138	78.60%	FE<200, CU<200, NI<200, AL=842	SUPLECAM
155mm Projectile	RM6651-203	79.00%		CAMDS
155mm Projectile	RM5651-138	79.60%		SUPLECAM
155mm Projectile	RM5651-129	79.80%		SUPLECAM
155mm Projectile	RM5651-205	80.30%		SUPLECAM
155mm Projectile	RM5651-160	81.00%		SUPLECAM
155mm Projectile	RM6651-242	81.30%	FE=3279, CU=BDL, NI=BDL, AL=BDL	SUPLECAM
155mm Projectile	RM5651-151	81.40%		SUPLECAM
155mm Projectile	RM5651-122	82.00%		SUPLECAM
155mm Projectile	RM5651-135	82.00%		SUPLECAM
155mm Projectile	RM5651-135	82.00%	FE<200, CU<200, NI<200, AL=708	SUPLECAM
155mm Projectile	RM5651-167	82.10%		SUPLECAM
155mm Projectile	RM5651-122	82.80%		SUPLECAM
155mm Projectile	RM5651-134	83.20%		SUPLECAM
155mm Projectile	RM5651-134	83.20%	FE<200, CU<200, NI<200, AL=835	SUPLECAM
155mm Projectile	RM6651-234	84.00%		SUPLECAM
155mm Projectile	RM5651-92	85.70%		SUPLECAM
155mm Projectile	RM5651-134	87.50%		CAMDS
155mm Projectile	RM5651-134	88.00%		CAMDS
	MAX	88.00%		
	MIN	59.60%		
	AVG	78.13%		
	SDEV	5.68%		
MC1 Bomb	RM5651-118	76.30%		SUPLECAM
MC1 Bomb	RM5651-118	76.30%	FE<100, CU<100, NI<100, AL=1150	SUPLECAM
MC1 Bomb	RM5651-183	78.80%		CAMDS
MC1 Bomb	RM5651-104	80.30%		CAMDS
MC1 Bomb	RM5651-110	80.30%		CAMDS
MC1 Bomb	RM5651-168	81.00%		SUPLECAM
MC1 Bomb	RM5651-60	81.30%		SUPLECAM
MC1 Bomb	RM5651-60	81.30%	FE<100, CU<100, NI<100, AL=850	SUPLECAM
MC1 Bomb	RM5651-60	81.30%	FE<100, CU<100, NI<100, AL=850	SUPLECAM
MC1 Bomb	RM5651-127	81.60%		SUPLECAM
MC1 Bomb	RM5651-127	81.60%	FE<100, CU<100, NI<100, AL=1025	SUPLECAM
MC1 Bomb	RM4651-32	81.90%		SUPLECAM
MC1 Bomb	RM5651-32	81.90%	FE<100, CU<100, NI<100, AL=1150	SUPLECAM
MC1 Bomb	RM5651-108	82.20%	FE<100, CU<100, NI<100, AL=1250	SUPLECAM
MC1 Bomb	RM5651-110	82.20%		SUPLECAM
MC1 Bomb	RM5651-183	82.70%		SUPLECAM
MC1 Bomb	RM5651-183	82.70%	FE<100, CU<100, NI<100, AL=300	SUPLECAM
MC1 Bomb	RM5651-115	83.70%		SUPLECAM
MC1 Bomb	RM5651-115	83.70%	FE=200, CU<100, NI<100, AL=1050	SUPLECAM
MC1 Bomb	RM5651-55	83.90%		SUPLECAM

TABLE 2-A-3
GB AGENT PURITY

Munition	Agent Lot	Purity	Metals	Source
MC1 Bomb	RM5651-55	83.90%	FE<100, CU<100, NI<100, AL=1150	SUPLECAM
MC1 Bomb	RM5651-104	84.20%		SUPLECAM
MC1 Bomb	RM5651-104	84.20%	FE<100, CU<100, NI<100, AL=300	SUPLECAM
MC1 Bomb	RM5651-126	84.30%		CAMDS
MC1 Bomb	RM5651-136	84.80%		SUPLECAM
MC1 Bomb	RM5651-136	84.80%	FE=200, CU<100, NI<100, AL=1150	SUPLECAM
MC1 Bomb	RM5651-58	84.80%		SUPLECAM
MC1 Bomb	RM5651-58	84.80%	FE=100, CU<100, NI<100, AL=300	SUPLECAM
MC1 Bomb	RM5651-178	84.90%		CAMDS
MC1 Bomb	RM5651-144	85.00%		SUPLECAM
MC1 Bomb	RM5651-144	85.00%	FE=200, CU<100, NI<100, AL=1190	SUPLECAM
MC1 Bomb	RM5651-140	85.10%		SUPLECAM
MC1 Bomb	RM5651-140	85.10%	FE=150, CU<100, NI<100, AL=1050	SUPLECAM
MC1 Bomb	RM5651-125	85.50%		CAMDS
MC1 Bomb	RM5651-179	85.60%	FE<100, CU<100, NI<100, AL=950	SUPLECAM
MC1 Bomb	RM4651-52	85.70%		SUPLECAM
MC1 Bomb	RM5651-186	85.70%		SUPLECAM
MC1 Bomb	RM5651-186	85.70%	FE<100, CU<100, NI<100, AL=1050	SUPLECAM
MC1 Bomb	RM5651-52	85.70%	FE=100, CU<100, NI<100, AL-1150	SUPLECAM
MC1 Bomb	RM5651-57	85.70%		SUPLECAM
MC1 Bomb	RM5651-57	85.70%	FE<100, CU<100, NI<100, AL=1000	SUPLECAM
MC1 Bomb	RM5651-116	86.10%		SUPLECAM
MC1 Bomb	RM5651-116	86.10%	FE=100, CU<100, NI<100, AL=500	SUPLECAM
MC1 Bomb	RM5651-117	86.20%		SUPLECAM
MC1 Bomb	RM5651-133	86.20%	FE=150, CU<100, NI<100, AL=1100	SUPLECAM
MC1 Bomb	RM5651-122	86.30%		SUPLECAM
MC1 Bomb	RM5651-130	86.40%		SUPLECAM
MC1 Bomb	RM5651-130	86.40%	FE=350, CU<100, NI<100, AL=400	SUPLECAM
MC1 Bomb	RM5651-131	86.80%		SUPLECAM
MC1 Bomb	RM5651-131	86.80%	FE=100, CU<100, NI<100, Al=1050	SUPLECAM
MC1 Bomb	RM5651-108	86.90%		SUPLECAM
MC1 Bomb	RM5651-108	86.90%	FE<100, CU<100, NI<100, AL=300	SUPLECAM
MC1 Bomb	RM5651-129	86.90%		SUPLECAM
MC1 Bomb	RM5651-129	86.90%	FE=100, CU<100, NI<100, AL=400	SUPLECAM
MC1 Bomb	RM5651-137	87.10%		SUPLECAM
MC1 Bomb	RM5651-137	87.10%	FE=100, CU<100, NI<100, AL=1100	SUPLECAM
MC1 Bomb	RM5651-175	87.10%	FE=150, CU<100, NI<100, AL=400	SUPLECAM
MC1 Bomb	RM5651-178	87.20%		SUPLECAM
MC1 Bomb	RM5651-178	87.20%	FE=100, CU<100, NI<100, AL=250	SUPLECAM
MC1 Bomb	RM5651-173	87.30%		SUPLECAM
MC1 Bomb	RM5651-173	87.30%	FE<100, CU<100, NI<100, AL=1250	SUPLECAM
MC1 Bomb	RM5651-142	87.40%		SUPLECAM
MC1 Bomb	RM5651-142	87.40%	FE<100, CU<100, NI<100, AL=1050	SUPLECAM
MC1 Bomb	RM5651-179	87.60%		SUPLECAM
MC1 Bomb	RM5651-143	87.70%		SUPLECAM
MC1 Bomb	RM5651-143	87.70%	FE=150, CU<100, NI<100, AL=350	SUPLECAM
MC1 Bomb	RM5651-134	87.90%		SUPLECAM
MC1 Bomb	RM5651-134	87.90%	FE=150, CU<100, NI<100, AL=1050	SUPLECAM

TABLE 2-A-3
GB AGENT PURITY

Munition	Agent Lot	Purity	Metals	Source
MC1 Bomb	RM5651-123	88.00%		SUPLECAM
MC1 Bomb	RM5651-124	88.00%		SUPLECAM
MC1 Bomb	RM5651-124	88.00%	FE=100, CU<100, NI<100, AL=300	SUPLECAM
MC1 Bomb	RM5651-117	88.20%	FE=250, CU<100, NI<100, Al=300	SUPLECAM
MC1 Bomb	RM5651-119	88.20%		SUPLECAM
MC1 Bomb	RM5651-119	88.20%	FE=100, CU<100, NI<100, AL=300	SUPLECAM
MC1 Bomb	RM5651-126	88.20%		SUPLECAM
MC1 Bomb	RM5651-126	88.20%	FE=150, CU<100, NI<100, AL=300	SUPLECAM
MC1 Bomb	RM5651-133	88.20%		SUPLECAM
MC1 Bomb	RM5651-132	88.30%		SUPLECAM
MC1 Bomb	RM5651-132	88.30%	FE=500, CU<100, NI<100, AL=300	SUPLECAM
MC1 Bomb	RM5651-132	88.30%	FE=500, CU<100, NI<100, AL=300	SUPLECAM
MC1 Bomb	RM5651-172	88.40%		SUPLECAM
MC1 Bomb	RM5651-172	88.40%	FE<100, CU<100, NI<100, AL=1000	SUPLECAM
MC1 Bomb	RM5651-99	88.40%	FE<100, CU<100, NI <100, AL=100	SUPLECAM
MC1 Bomb	RM5651-99	88.40%		SUPLECAM
MC1 Bomb	RM5651-191	88.50%		SUPLECAM
MC1 Bomb	RM5651-191	88.50%	FE<100, CU<100, NI<100, AL=400	SUPLECAM
MC1 Bomb	RM5651-125	88.80%		SUPLECAM
MC1 Bomb	RM5651-125	88.80%	FE=350, CU<100, NI<100, AL=300	SUPLECAM
MC1 Bomb	RM5651-139	88.80%		SUPLECAM
MC1 Bomb	RM5651-139	88.80%	FE=100, CU<100, NI<100, AL=300	SUPLECAM
MC1 Bomb	RM5651-111	89.00%		SUPLECAM
MC1 Bomb	RM5651-111	89.00%	FE=100, CU<100, NI<100, AL=300	SUPLECAM
MC1 Bomb	RM5651-164	89.00%	FE<100, CU<100, NI<100, AL=250	SUPLECAM
MC1 Bomb	RM5651-192	89.10%		SUPLECAM
MC1 Bomb	RM5651-123	89.40%	FE<100, CU<100, NI<100, AL=1150	SUPLECAM
MC1 Bomb	RM5651-164	89.80%		SUPLECAM
MC1 Bomb	RM5651-168	91.20%	FE<100, CU<100, NI<100, AL=1000	SUPLECAM
MC1 Bomb	RM5651-114	92.00%		SUPLECAM
MC1 Bomb	RM5651-135	92.50%		SUPLECAM
	MAX	92.50%		
	MIN	76.30%		
	AVG	86.01%		
	SDEV	2.99%		
Ton Container	RM76039-384	38.80%		CAMDS
Ton Container	RM76039-384	39.30%	FE<200, CU<200, NI<200, AL=1200	SUPLECAM
Ton Container		39.70%		CAMDS
Ton Container	RM6651-239	42.40%		CAMDS
Ton Container	RM6651-273	43.90%	FE<200, CU<200, NI<200, AL=730	SUPLECAM
Ton Container	RM4651-53	46.80%		CAMDS
Ton Container	RM76039-370	46.80%		CAMDS
Ton Container	RM4651-53	47.70%		CAMDS
Ton Container	RM76039-370	48.00%		CAMDS
Ton Container	RM76039-266	50.00%		CAMDS
Ton Container	RM76039-374	51.20%		CAMDS

TABLE 2-A-3
GB AGENT PURITY

Munition	Agent Lot	Purity	Metals	Source
Ton Container	RM76039-341	56.30%		CAMDS
Ton Container	RM76039-341	57.20%	FE<200, CU<200, NI<200, AL=980	SUPLECAM
Ton Container	RM6651-272	58.20%	FE<200, CU<200, NI<200, AL=500	SUPLECAM
Ton Container	RM76039-371	58.60%		CAMDS
Ton Container	RM76039-349	58.70%	FE=212, CU<200, NI<200, AL=840	SUPLECAM
Ton Container	RM76039-370	58.90%	FE=217, CU<200, NI<200, AL=850	SUPLECAM
Ton Container	RM76039-383	59.00%	FE<200, CU<200, NI<200, AL=700	SUPLECAM
Ton Container	RM76039-385	60.00%	FE<200, CU<200, NI<200, AL=690	SUPLECAM
Ton Container	RM76039-370	60.00%		CAMDS
Ton Container	RM6651-262	61.10%		SUPLECAM
Ton Container	RM76039-329	61.40%	FE<200, CU<200, NI<200, AL=950	SUPLECAM
Ton Container	RM76038-318	61.60%	FE<200, CU<200, NI<200, AL=1830	SUPLECAM
Ton Container	RM6651-286	61.70%	FE<200, CU<200, NI<200, AL=1000	SUPLECAM
Ton Container	RM76039-371	62.00%	FE=208, CU<200, NI<200, AL=750	SUPLECAM
Ton Container	RMRM6651-225	62.20%	FE<200, CU<200, NI<200, AL=1030	SUPLECAM
Ton Container	RM76039-371	62.50%		CAMDS
Ton Container	RM6651-257	63.10%		CAMDS
Ton Container	RM76039-264	63.70%		CAMDS
Ton Container	RM76039-342	64.00%	FE=300, CU<200, NI<200, AL=950	SUPLECAM
Ton Container	RM76039-342	64.60%		CAMDS
Ton Container	RM6651-265	64.70%		CAMDS
Ton Container	RM6651-257	65.60%	FE<200, CU<200, NI<200, AL=800	SUPLECAM
Ton Container	RM6651-284	66.40%	FE=217, CU<200, NI<200, AL=1010	SUPLECAM
Ton Container	RM76039-374	66.70%		CAMDS
Ton Container	RM76039-341	66.80%		CAMDS
Ton Container	RM76039-264	67.00%		CAMDS
Ton Container	RM76039-367	67.90%	FE<200, CU<200, NI<200, AL=1020	SUPLECAM
Ton Container	RM76039-324	68.60%	FE=625, CU<200, NI<200, AL=1010	SUPLECAM
Ton Container	RM76039-342	68.60%		CAMDS
Ton Container	RM6651-265	68.70%	FE=212, CU<200, NI<200, AL=1020	SUPLECAM
Ton Container	RM76039-329	68.70%		CAMDS
Ton Container	RM76039-423	69.00%		CAMDS
Ton Container	RM76039-343	69.30%	FE=570, CU<200, NI<200, AL=860	SUPLECAM
Ton Container	RM6651-276	69.40%	FE<200, CU<200, NI<200, AL=500	SUPLECAM
Ton Container	RM76039-289	69.40%		CAMDS
Ton Container	RM6651-257	69.50%		CAMDS
Ton Container	RM76039-324	69.50%		CAMDS
Ton Container	RM86025-20	69.60%		CAMDS
Ton Container	RM76039-323	69.90%		CAMDS
Ton Container	RM76039-341	70.00%		CAMDS
Ton Container	RM76039-336	70.10%	FE<200, CU<200, NI<200, AL=70.1	SUPLECAM
Ton Container	RM76039-412	70.20%		CAMDS
Ton Container	RM6651-257	70.40%		CAMDS
Ton Container	RM6651-277	70.80%	FE<200, CU<200, NI<200, AL=760	SUPLECAM
Ton Container	RM76039-336	70.80%		CAMDS
Ton Container	RM76039-358	71.00%	FE=1350, CU<200, NI<200, AL=700	SUPLECAM
Ton Container	RM76039-264	71.00%		CAMDS
Ton Container	RM76039-374	71.00%		CAMDS

TABLE 2-A-3
GB AGENT PURITY

Munition	Agent Lot	Purity	Metals	Source
Ton Container	RM76039-346	71.10%	FE<200, CU<200, NI<200, AL=970	SUPLECAM
Ton Container	RM76039-321	71.40%		CAMDS
Ton Container	RM76039-289	71.50%	FE<200, CU<200, NI<200, AL=910	SUPLECAM
Ton Container	RM76039-321	71.50%	FE<200, CU<200, NI<200, AL=950	SUPLECAM
Ton Container	RM6651-287	71.60%	FE<207, CU<200, NI<200, AL=1070	SUPLECAM
Ton Container	RM6651-265	71.80%		CAMDS
Ton Container	RM76039-343	71.80%		CAMDS
Ton Container	RM6651-271	72.10%	FE<200, CU<200, NI<200, AL=770	SUPLECAM
Ton Container	RM76039-382	72.10%	FE=600, CU<200, NI<200, AL=590	SUPLECAM
Ton Container	RM76039-331	72.20%	FE<200, CU<200, NI<200, AL=850	SUPLECAM
Ton Container	RM76039-345	72.40%	FE<200, CU<200, NI<200, AL=980	SUPLECAM
Ton Container	RM5651-287	72.50%		CAMDS
Ton Container		72.60%		CAMDS
Ton Container	RM76039-323	72.70%		SUPLECAM
Ton Container	RM6651-257	72.70%		CAMDS
Ton Container	RM76039-345	72.70%		CAMDS
Ton Container	RM76039-388	72.80%	FE<200, CU<200, NI<200, AL=1010	SUPLECAM
Ton Container	RM76039-368	72.90%	FE<200, CU<200, NI<200, AL=700	SUPLECAM
Ton Container	RM6651-299	73.00%	FE<200, CU<200, NI<200, AL=990	SUPLECAM
Ton Container	RM76039-346	73.10%		CAMDS
Ton Container	RM76039-336	73.30%		CAMDS
Ton Container	RM76039-327	73.40%	FE<200, CU<200, NI<200, AL=830	SUPLECAM
Ton Container	RM76039-363	73.40%	FE=360, CU<200, NI<200, AL=1070	SUPLECAM
Ton Container	RM5651-287	73.40%		CAMDS
Ton Container	RM6651-278	73.60%	FE=215, CU<200, NI<200, AL=950	SUPLECAM
Ton Container	RM76039-342	73.60%		CAMDS
Ton Container	RM6651-268	73.90%	FE=360, CU<200, NI<200, AL=1930	SUPLECAM
Ton Container	RM6651-233	73.90%	FE<200, CU<200, NI<200, Al=910	SUPLECAM
Ton Container	RM6651-265	73.90%		CAMDS
Ton Container	RM86039-418	74.00%		CAMDS
Ton Container	RM76039-324	74.10%		CAMDS
Ton Container	RM76039-352	74.20%	FE=352, CU<200, NI<200, AL=1000	SUPLECAM
Ton Container	RM76039-356	74.20%	FE=307, CU<200, NI<200, AL=840	SUPLECAM
Ton Container	RM76039-343	74.20%		CAMDS
Ton Container	RM5651-62	74.30%	FE<200, CU<200, NI<200, AL=280	SUPLECAM
Ton Container	RM6651-278	74.30%		CAMDS
Ton Container	RM6651-242	74.50%		CAMDS
Ton Container	RM6651-299	74.50%		CAMDS
Ton Container	RM76039-392	74.60%	FE<200, CU<200, NI<200, AL=1020	SUPLECAM
Ton Container	RM86039-418	74.60%		CAMDS
Ton Container	RM6651-299	74.70%		CAMDS
Ton Container	RM76039-412	74.80%		CAMDS
Ton Container	RM6651-270	75.00%	FE<200, CU<200, NI<200, AL=1860	SUPLECAM
Ton Container	RM5651-92	75.00%		CAMDS
Ton Container	RM6651-278	75.00%		CAMDS
Ton Container	RM76039-346	75.00%		CAMDS
Ton Container	RM6651-274	75.20%	FE=253, CU<200, NI<200, AL=820	SUPLECAM
Ton Container	RM6651-265	75.30%		CAMDS

TABLE 2-A-3
GB AGENT PURITY

Munition	Agent Lot	Purity	Metals	Source
Ton Container	RM76039-289	75.30%		CAMDS
Ton Container	RM76039-387	75.40%	FE<200, CU<200, NI<200, AL=780	SUPLECAM
Ton Container	RM6651-240	75.70%	FE<200, CU<200, NI<200, AL=1030	SUPLECAM
Ton Container	RM76039-373	75.70%	FE=425, CU<200, NI<200, AL=900	SUPLECAM
Ton Container	RM76039-289	75.80%		CAMDS
Ton Container	RM5651-367	75.90%		CAMDS
Ton Container	RM76039-328	76.00%	FE<200, CU<200, NI<200, AL=560	SUPLECAM
Ton Container	RM76039-289	76.00%		CAMDS
Ton Container	RM76039-321	76.00%		CAMDS
Ton Container	RM76039-345	76.10%		CAMDS
Ton Container	RM86039-414	76.10%		CAMDS
Ton Container	RM76039-393	76.20%	FE<200, CU<200, NI<200, AL=640	SUPLECAM
Ton Container	RM4651-53	76.20%	FE<200, CU<200, NI<200, AL=1030	SUPLECAM
Ton Container	RM6651-229	76.20%	FE<200, CU<200, NI<200, AL=1330	SUPLECAM
Ton Container	RM76039-381	76.30%	FE=300, CU<200, NI<200, AL=1020	SUPLECAM
Ton Container	RM76039-381	76.30%		CAMDS
Ton Container	RM86039-414	76.40%		CAMDS
Ton Container	RM76039-350	76.50%	FE=555, CU<200, NI<200, AL=1030	SUPLECAM
Ton Container	RM6651-231	76.50%	FE<200, CU<200, NI<200, AL=880	SUPLECAM
Ton Container	RM76036-374	76.50%		CAMDS
Ton Container	RM76039-323	76.50%		CAMDS
Ton Container	RM76039-416	76.60%		CAMDS
Ton Container	RM6651-295	76.70%	FE=207, CU<200, NI<200, AL=1120	SUPLECAM
Ton Container	RM76039-360	76.70%	FE=800, CU<200, NI<200, AL=1060	SUPLECAM
Ton Container	RM4651-53	76.80%		CAMDS
Ton Container	RM76039-364	76.90%	FE=360, CU<200, NI<200, AL=1060	SUPLECAM
Ton Container	RM76039-354	77.00%	FE=567, CU<200, NI<200, AL=860	SUPLECAM
Ton Container	RM6651-242	77.00%		CAMDS
Ton Container	RM6651-242	77.00%		CAMDS
Ton Container	RM76039-323	77.00%		CAMDS
Ton Container	RM76039-323	77.10%		CAMDS
Ton Container	RM76039-366	77.30%	FE<200, CU<200, NI<200, AL=1030	SUPLECAM
Ton Container	RM76039-323	77.50%		CAMDS
Ton Container	RM76039-321	77.60%		CAMDS
Ton Container	RM76039-374	77.70%	FE<200, CU<200, NI<200, AL=590	SUPLECAM
Ton Container	RM6651-262	77.70%		CAMDS
Ton Container	RM86039-418	77.70%		CAMDS
Ton Container	RM76039-336	77.80%		CAMDS
Ton Container	RM86025-20	78.00%		CAMDS
Ton Container	RM6651-239	78.10%		CAMDS
Ton Container	RM76039-416	78.10%		CAMDS
Ton Container	RM6651-262	78.30%		CAMDS
Ton Container	RM76039-323	78.30%		CAMDS
Ton Container	RM76039-371	78.40%		CAMDS
Ton Container	RM76039-365	78.60%	FE=440, CU<200, NI<200, AL=940	SUPLECAM
Ton Container	RM5651-183	78.80%		CAMDS
Ton Container	RM5651-73	78.80%	FE<200, CU<200, NI<200, AL=2020	SUPLECAM
Ton Container	RM76039-323	78.80%		CAMDS

TABLE 2-A-3
GB AGENT PURITY

Munition	Agent Lot	Purity	Metals	Source
Ton Container	RM76039-369	79.00%	FE<200, CU<200, NI<200, AL=1050	SUPLECAM
Ton Container	RM6651-203	79.00%		CAMDS
Ton Container	RM6651-297	79.10%	FE<200, CU<200, NI<200, AL=1000	SUPLECAM
Ton Container		79.10%		CAMDS
Ton Container	RM76039-369	79.20%		CAMDS
Ton Container	RM76039-345	79.30%		CAMDS
Ton Container	RM76039-323	79.40%		CAMDS
Ton Container	RM76039-369	79.40%		CAMDS
Ton Container	RM86039-414	79.40%		CAMDS
Ton Container	RM76039-329	79.50%		CAMDS
Ton Container	RM76039-323	79.60%		CAMDS
Ton Container	RM76039-381	79.60%		CAMDS
Ton Container	RM6651-239	79.70%	FE<200, CU<200, NI<200, AL=1080	SUPLECAM
Ton Container	RM6651-279	79.70%	FE<200, CU<200, NI<200, AL=780	SUPLECAM
Ton Container	RM76039-323	79.70%		CAMDS
Ton Container	RM76039-370	79.80%		CAMDS
Ton Container	RM6651-299	80.00%		CAMDS
Ton Container	RM76039-355	80.30%	FE<200, CU<200, NI<200, AL=560	SUPLECAM
Ton Container	RM5651-104	80.30%		CAMDS
Ton Container	RM5651-110	80.30%		CAMDS
Ton Container	RM5651-144	80.30%		CAMDS
Ton Container	RM76039-280	80.30%		CAMDS
Ton Container	RM76039-323	80.30%		CAMDS
Ton Container	RM6651-293	80.40%	FE<200, CU<200, NI<200, AL=970	SUPLECAM
Ton Container	RM76039-323	80.40%		CAMDS
Ton Container	RM6651-228	80.50%	FE<200, CU<200, NI<200, AL=1000	SUPLECAM
Ton Container	RM6651-262	80.50%		CAMDS
Ton Container	RM76039-412	80.50%		CAMDS
Ton Container	RM76039-280	80.70%	FE<200, CU<200, NI<200, AL-1769	SUPLECAM
Ton Container	RM86039-423	80.70%		CAMDS
Ton Container	RM76039-332	80.80%	FE<200, CU<200, NI<200, AL=550	SUPLECAM
Ton Container	RM76039-324	80.80%		CAMDS
Ton Container	RM76039-362	80.90%	FE=567, CU<200, NI<200, AL=1980	SUPLECAM
Ton Container	RM6651-262	81.00%		CAMDS
Ton Container	RM6651-262	81.00%		CAMDS
Ton Container	RM76039-369	81.00%		CAMDS
Ton Container	RM76039-280	81.10%		CAMDS
Ton Container	RM6651-314	81.20%	FE<200, CU<200, NI<200, AL=1760	SUPLECAM
Ton Container	RM76039-379	81.20%	FE<200, CU<200, NI<200, AL=950	SUPLECAM
Ton Container	RM76039-386	81.20%	FE<200, CU<200, NI<200, AL=810	SUPLECAM
Ton Container	RM76039-372	81.30%	FE=300, CU<200, NI<200, AL=920	SUPLECAM
Ton Container	RM76039-280	81.40%		CAMDS
Ton Container	RM6651-266	81.50%	FE=233, CU<200, NI<200, AL=1000	SUPLECAM
Ton Container	RM76039-280	81.60%		CAMDS
Ton Container	RM5651-142	81.70%		CAMDS
Ton Container	RM6651-262	81.70%		CAMDS
Ton Container	RM6651-262	81.80%		CAMDS
Ton Container	RM5651-109	81.90%		CAMDS

TABLE 2-A-3
GB AGENT PURITY

Munition	Agent Lot	Purity	Metals	Source
Ton Container	RM6651-262	82.00%		CAMDS
Ton Container	RM76039-280	82.10%		CAMDS
Ton Container	RM6651-262	82.20%		CAMDS
Ton Container	RM6651-262	82.20%		CAMDS
Ton Container	RM76039-337	82.30%	FE=500, CU<200, NI<200, AL=900	SUPLECAM
Ton Container	RM5651-137	82.40%		CAMDS
Ton Container	RM6651-239	82.50%		CAMDS
Ton Container	RM86039-423	82.50%		CAMDS
Ton Container	RM76036-374	82.70%		CAMDS
Ton Container	RM5651-169	82.80%	FE<200, CU<200, NI<200, AL=1160	SUPLECAM
Ton Container	RM76036-374	82.80%		CAMDS
Ton Container	RM76039-280	82.80%		CAMDS
Ton Container	RM76036-374	82.90%		CAMDS
Ton Container	RM5651-107	83.00%		CAMDS
Ton Container	RM86039-423	83.10%		CAMDS
Ton Container	RM6651-262	83.20%		CAMDS
Ton Container	RM86039-423	83.20%		CAMDS
Ton Container	RM6651-262	83.30%		CAMDS
Ton Container	RM6651-260	83.40%	FE<200, CU<200, NI<200, AL=930	SUPLECAM
Ton Container	RM5651-367	83.60%		CAMDS
Ton Container	RM5651-123	83.70%		CAMDS
Ton Container	RM86039-423	84.00%		CAMDS
Ton Container	RM86039-423	84.00%		CAMDS
Ton Container	RM76039-374	84.10%		CAMDS
Ton Container	RM5651-168	84.20%		CAMDS
Ton Container	RM5651-126	84.30%		CAMDS
Ton Container	RM76039-374	84.30%		CAMDS
Ton Container	RM6651-239	84.40%		CAMDS
Ton Container	RM76039-390	84.50%	FE<200, CU<200, NI<200, AL=1230	SUPLECAM
Ton Container	RM76036-374	84.50%		CAMDS
Ton Container	RM5651-132	84.60%		CAMDS
Ton Container	RM76039-374	84.60%		CAMDS
Ton Container	RM86039-423	84.60%		CAMDS
Ton Container	RM76039-374	84.70%		CAMDS
Ton Container	RM86039-423	84.70%		CAMDS
Ton Container	RM76039-378	84.80%	FE<200, CU<200, NI<200, AL=1000	SUPLECAM
Ton Container	RM5651-178	84.90%		CAMDS
Ton Container	RM76039-371	85.00%		CAMDS
Ton Container	RM86039-423	85.10%		CAMDS
Ton Container	RM86039-423	85.30%		CAMDS
Ton Container	RM5651-390	85.40%		CAMDS
Ton Container	RM76039-370	85.40%		CAMDS
Ton Container	RM5651-125	85.50%		CAMDS
Ton Container	RM4651-52	85.60%		CAMDS
Ton Container	RM6651-261	85.70%	FE=310, CU<200, NI<200, AL=2220	SUPLECAM
Ton Container	RM86039-423	85.70%		CAMDS
Ton Container	RM86039-423	85.70%		CAMDS
Ton Container	RM5651-115	85.80%		CAMDS

TABLE 2-A-3
GB AGENT PURITY

Munition	Agent Lot	Purity	Metals	Source
Ton Container	RM86039-423	85.90%		CAMDS
Ton Container	RM5651-124	86.00%		CAMDS
Ton Container	RM76039-374	86.00%		CAMDS
Ton Container	RM76039-390	86.30%		CAMDS
Ton Container	RM76036-374	86.40%		CAMDS
Ton Container	RM5651-109	86.60%		CAMDS
Ton Container	RM6651-262	86.90%		CAMDS
Ton Container	RM5651-134	87.40%		CAMDS
Ton Container	RM5651-167	87.60%		CAMDS
Ton Container	RM76039-380	87.90%	FE<200, CU<200, NI<200, AL=1100	SUPLECAM
Ton Container	RM5651-167	87.90%		CAMDS
Ton Container	RM5651-134	88.00%		CAMDS
Ton Container	RM76039-266	88.10%		CAMDS
Ton Container	RM76039-323	88.40%		CAMDS
Ton Container	RM5651-116	88.70%		CAMDS
Ton Container	RM5651-174	89.10%	FE<200, CU<200, NI<200, AL=970	SUPLECAM
Ton Container	RM6651-225	92.60%		SUPLECAM
	MAX	92.60%		
	MIN	38.80%		
	AVG	75.51%		
	SDEV	9.43%		
M55 Rocket	1034-46-1282	77.20%		CRDEC
M55 Rocket		80.30%		CAMDS
M55 Rocket	1034-55-1255	81.70%		CRDEC
M55 Rocket		81.70%		CAMDS
M55 Rocket	1034-46-1282	81.90%		CRDEC
M55 Rocket	1034-55-1255	82.40%		CRDEC
M55 Rocket		82.40%		CAMDS
M55 Rocket	1034-55-1255	82.50%		CRDEC
M55 Rocket	1033-52-1053	82.70%		CRDEC
M55 Rocket	1034-55-1255	83.40%		CRDEC
M55 Rocket	1034-55-1255	83.80%		CRDEC
M55 Rocket		84.20%		CAMDS
M55 Rocket		84.50%		CAMDS
M55 Rocket		85.60%		CAMDS
M55 Rocket		85.80%		CAMDS
M55 Rocket		86.00%		CAMDS
M55 Rocket		88.70%		CAMDS
M55 Rocket	1033-62-1094	92.30%		CRDEC
M55 Rocket	RM5651-59	93.10%		CRDEC
	MAX	93.10%		
	MIN	77.20%		
	AVG	84.22%		
	SDEV	3.75%		

TABLE 2-A-4
VX AGENT PURITY

Munition	Agent Lot	Purity	Metals	Source
TMU28/B	NY1-767-A44	93.30%	FE<100, AL<100, CU<100, NI<100	SUPLECAM
TMU28/B	NY1-767-A45	94.70%	FE<100, AL<100, CU<100, NI<100	SUPLECAM
TMU28/B	NY1-767-A40	95.30%	FE<100, AL<100, CU<100, NI<100	SUPLECAM
TMU28/B	NY1-767-A41	97.00%	FE<100, AL<100, CU<100, NI<100	SUPLECAM
TMU28/B	NY1-767-A42	97.70%	FE<100, AL<100, CU<100, NI<100	SUPLECAM
	MAX	97.70%		
	MIN	93.30%		
	AVG	95.60%		
	SDEV	1.58%		
Ton Container	NY1-767-A35	27.10%		CAMDS
Ton Container	NY1-767-A35	27.10%		CAMDS
Ton Container	NY1-767-A26	37.60%		CAMDS
Ton Container	NY1-767-A45	47.60%		CAMDS
Ton Container	NY1-767-A45	47.60%		CAMDS
Ton Container	NY1-767-A35	54.40%		CAMDS
Ton Container	NY1-767-A35	54.40%		CAMDS
Ton Container	NY1-767-A35	75.20%		CAMDS
Ton Container	NY1-767-A35	75.20%		CAMDS
Ton Container	NY1-767-A32	78.60%		CAMDS
Ton Container	NY1-767-A32	78.60%		CAMDS
Ton Container	NY1-767-A35	80.20%		CAMDS
Ton Container	NY1-767-A35	80.20%		CAMDS
Ton Container	NY1-767-A35	82.00%		CAMDS
Ton Container	NY1-767-A35	82.90%		CAMDS
Ton Container	NY1-767-A32	85.30%		CAMDS
Ton Container	NY1-767-A33	85.50%		SUPLECAM
Ton Container	NY1-767-A35	85.80%		SUPLECAM
Ton Container	NY1-767-A35	86.90%		CAMDS
Ton Container	NY1-767-A35	86.90%		CAMDS
Ton Container	NY1-767-A35	86.90%		CRDEC
Ton Container	U-4308CTFN	86.90%		CAMDS
Ton Container	U-4308CTFN	87.50%		CAMDS
Ton Container	NY1-767-A33	87.60%		CAMDS
Ton Container	NY1-767-A33	87.60%		CAMDS
Ton Container	NY1-767-A26	88.10%		SUPLECAM
Ton Container	NY1-767-A40	88.10%		CAMDS
Ton Container	NY1-767-A32	88.50%		CAMDS
Ton Container	NY1-767-A32	88.50%		CAMDS
Ton Container	NY1-767-A28	88.60%		SUPLECAM
Ton Container	NY1-767-A40	89.00%		CAMDS
Ton Container	NY1-767-A35	89.40%		CAMDS
Ton Container	NY1-767-A35	89.40%		CAMDS
Ton Container	NY1-767-A35	89.60%		CAMDS
Ton Container	NY1-767-A35	89.60%		CAMDS
Ton Container	NY1-767-A29	89.80%		SUPLECAM

TABLE 2-A-4
VX AGENT PURITY

Munition	Agent Lot	Purity	Metals	Source
Ton Container	NY1-767-A33	89.80%		CRDEC
Ton Container	U-8132CTFN	89.80%		CAMDS
Ton Container	NY1-767-A28	89.90%		CRDEC
Ton Container	NY1-767-A29	90.10%		CRDEC
Ton Container	NY1-767-A35	90.30%		CAMDS
Ton Container	NY1-767-A35	90.30%		CAMDS
Ton Container	NY1-767-A26	90.40%		CRDEC
Ton Container	NY1-767-A35	90.50%		CAMDS
Ton Container	NY1-767-A35	90.50%		CAMDS
Ton Container	NY1-767-A32	90.80%		CRDEC
Ton Container	NY1-767-A32	91.00%		SUPLECAM
Ton Container	NY1-767-A45	91.00%		CAMDS
Ton Container	NY1-767-A35	91.40%		CAMDS
Ton Container	NY1-767-A35	91.40%		CAMDS
Ton Container	U-4308CTFN	92.30%		CAMDS
Ton Container	U-8132CTFN	92.60%		CAMDS
Ton Container	NY1-767-A35	93.00%		CAMDS
Ton Container	NY1-767-A35	93.00%		CAMDS
Ton Container	U-4308CTFN	93.20%		CAMDS
Ton Container	NY1-767-A35	93.50%		CAMDS
Ton Container	NY1-767-A35	93.50%		CAMDS
Ton Container	NY1-767-A35	93.70%		CAMDS
Ton Container	NY1-767-A35	93.70%		CAMDS
Ton Container	NY1-767-32	94.50%		CAMDS
Ton Container	NY1-767-A32	94.50%		CAMDS
Ton Container	NY1-767-A35	94.70%		CAMDS
Ton Container	NY1-767-A35	94.70%		CAMDS
Ton Container	NY1-767-A35	94.90%		CAMDS
Ton Container	NY1-767-A35	94.90%		CAMDS
Ton Container	NY1-767-A35	96.70%		CAMDS
Ton Container	NY1-767-A35	96.70%		CAMDS
Ton Container	U-8132CTFN	98.50%		CAMDS
	MAX	98.50%		
	MIN	27.10%		
	AVG	84.41%		
	SDEV	15.43%		
M23 Mine	NY1-767-A34	72.40%		SUPLECAM
M23 Mine	NY1-767-A34	75.60%	FE=29.4, AL=54.6, CU=19.8, NI=159	SUPLECAM
M23 Mine	NY1-767-A34	75.80%	FE=43.7, AL=39.2, CU=25.2, NI=98.3	SUPLECAM
M23 Mine	NY1-767-A34	78.40%	FE=31.9, AL=63.8, CU=9.7, NI=0.6	SUPLECAM
M23 Mine	NY1-767-A34	79.90%		SUPLECAM
M23 Mine	NY1-767-A34	80.80%	FE=33.7, AL=32.4, CU=23.0, NI=224.3	SUPLECAM
M23 Mine	NY1-767-A34	81.50%	FE=56.3, AL=65.7, CU=23.5, NI=178.3	SUPLECAM
M23 Mine	NY1-767-A34	81.70%	FE=32.8, AL=116.2, CU=17.3, NI=161.9	SUPLECAM
M23 Mine	NY1-767-A34	82.30%	FE=29.3, AL=81.7, CU=13.8, NI=143.3	SUPLECAM

TABLE 2-A-4
VX AGENT PURITY

Munition	Agent Lot	Purity	Metals	Source
M23 Mine	NY1-767-A34	82.60%	FE=24.9, AL=89.0, CU=22.4, NI=486.7	SUPLECAM
M23 Mine	NY1-767-A34	84.70%	FE=21.9, AL=42.9, CU=10.1, NI=296.0	SUPLECAM
M23 Mine	NY1-767-A34	85.10%	FE NR, AL=62.7, CU=12.5, NI=315.7	SUPLECAM
M23 Mine	NY1-767-A34	85.10%	FE=31.9, AL=76.6, CU=11.8, NI=177.0	SUPLECAM
M23 Mine	NY1-767-A36	87.40%		SUPLECAM
M23 Mine	NY1-767-A22	88.30%	FE<200, AL<200, CU<200, NI<200	SUPLECAM
M23 Mine	NY1-767-A45	89.10%	FE<200, AL<200, CU<200. NI<200	SUPLECAM
M23 Mine	NY1-767-A34	89.70%	FE=61.4, AL=12.6, CU BDL, NI BDL	SUPLCAM
M23 Mine	NY1-767-A38	90.50%	FE<200, AL<200, CU<200, NI<200	SUPLECAM
	MAX	90.50%		
	MIN	72.40%		
	AVG	82.83%		
	SDEV	5.03%		
Proj 155	NY1-767-A27	72.40%		SUPLECAM
Proj 155	NY1-767-A45	83.30%	FE<200, AL<200, CU<200, NI<200	SUPLECAM
Proj 155	NY1-767-A29	83.70%		SUPLECAM
Proj 155	NY1-767-A26	84.40%		SUPLECAM
Proj 155	NY1-767-A25	85.00%		SUPLECAM
Proj 155	NY1-767-A23	86.10%	FE<200, AL<200, FE<200, AL<200, CU<200, NI<200	SUPLECAM
Proj 155	NY1-767-A40	86.10%		SUPLECAM
Proj 155	NY1-767-A44	86.10%	FE<200, AL<200, CU<200, NI<200	SUPLECAM
Proj 155	NY1-767-A32	86.40%		SUPLECAM
Proj 155	NY1-767-A41	89.80%	FE<200, AL<200, CU<200, NI<200	SUPLECAM
Proj 155	NY1-767-A42	92.20%	FE<200, AL<200, CU<200, NI<200	SUPLECAM
Proj 155	NY1-767-A43	93.80%	FE<200, AL<200, CU<200, NI<200	SUPLECAM
	MAX	93.80%		
	MIN	72.40%		
	AVG	85.78%		
	SDEV	5.12%		

TABLE 2-A-5
HD AGENT PURITY

Munition	Agent Lot	Purity	Metal	Source
Projectile 105	RM-5721-2	83.6%	FE=1920, CU=235, NI=BDL	SUPLECAM
Projectile 105	RM-5721-3	88.8%	FE=6184, CU=14.1, NI=BDL	SUPLECAM
Projectile 105	RM-5721-1	89.4%	FE=4538, CU=11.7, NI=3.54	SUPLECAM
	MAX	89.4%		
	MIN	83.6%		
	AVG	87.3%		
	SDEV	2.6%		
Ton Container	RM-113-188	50.5%	FE=2106	TEAD
Ton Container	RM-113-305	62.5%	FE=1946	TEAD
Ton Container	RM-113-369	64.4%	FE=1923	TEAD
Ton Container	RM-113-223	67.1%	FE=2702	TEAD
Ton Container	RM-113-174	67.3%		CAMDS
Ton Container	RM-113-174	67.3%		CAMDS
Ton Container	RM-113-193	69.8%	FE=2093	TEAD
Ton Container	RM-113-64	71.8%	FE=2494	TEAD
Ton Container	RM-113-341	71.8%	FE=1986	TEAD
Ton Container	RM-113-331	73.9%	FE=2372	TEAD
Ton Container	RM-113-180	74.3%	FE=1988	TEAD
Ton Container	RM-113-350	74.5%	FE=2140	TEAD
Ton Container	RM-113-47	75.3%	FE=2262.31	TEAD
Ton Container	RM-113-137	76.6%	FE=2814	TEAD
Ton Container	RM-113-205	77.2%	FE=2137	TEAD
Ton Container	RM-113-174	77.6%		CAMDS
Ton Container	RM-113-325	78.1%	FE=1729	TEAD
Ton Container	RM-113-174	78.5%		CAMDS
Ton Container	RM-113-174	78.5%		CAMDS
Ton Container	RM-113-255	78.6%	FE=2010	TEAD
Ton Container	RM-113-298	78.6%	FE=3511	TEAD
Ton Container	RM-113-151	79.5%	FE=2068	TEAD
Ton Container	RM-113-174	80.2%		CAMDS
Ton Container	RM-113-348	81.4%	FE=1952	TEAD
Ton Container	RM-113-240	81.7%	FE=2174	TEAD
Ton Container	RM-113-249	83.3%	FE=2125	TEAD
Ton Container	RM-113-216	83.5%	FE=2522	TEAD
Ton Container	RM-113-358	84.4%	FE=2304	TEAD
Ton Container	RM-113-152	84.5%	FE=2193	TEAD
Ton Container	RM-113-178	84.8%	FE=2429	TEAD
Ton Container	RM-113-306	84.8%	FE=1916	TEAD
Ton Container	RM-113-189	84.9%	FE=1836	TEAD
Ton Container	RM-113-99	85.0%	FE=1945	TEAD
Ton Container	RM-113-195	85.8%	FE=2807	TEAD
Ton Container	RM-113-247	85.8%	FE=2035	TEAD
Ton Container	RM-113-202	85.9%	FE=2134	TEAD
Ton Container	RM-113-46	87.2%	FE=2631.64	TEAD
Ton Container	RM-113-359	87.2%	FE=2629	TEAD

TABLE 2-A-5
HD AGENT PURITY

Munition	Agent Lot	Purity	Metal	Source
Ton Container	RM-113-134	87.5%	FE=2228	TEAD
Ton Container	RM-113-353	88.0%	FE=1899	TEAD
Ton Container	RM-113-144	88.4%	FE=2700	TEAD
Ton Container	RM-113-199	89.1%	FE=2091	TEAD
Ton Container	RM-113-340	89.3%	FE=2785	TEAD
Ton Container	U-4244CTFN	97.0%		CAMDS
	MAX	97.0%		
	MIN	50.5%		
	AVG	79.2%		
	SDEV	8.65%		

TABLE 2-B-1

Metals in Munitions (Metals with Feed Rate Limitations - Module V)

Metals (lb)	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ag	Tl
4.2" Cartridge (M2), Agent HT, Surface Area = 1.88 sq. ft.										
Metals in Munition Metal (embedded)	0	0	0	0	0.00044	0.04676	0	0	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Energetic	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0	0.01824	0	0.0094	0.00526	0.0329	0	0	0
TOTAL (lb, non-embedded)	**0**	**0**	**0.01824**	**0**	**0.0094**	**0.00526**	**0.0329**	**0**	**0**	**0**
4.2" Cartridge (M2A1), Agent HD, Surface Area = 1.88 sq. ft.										
Metals in Munition Metal (embedded)	0	0	0	0	0.00044	0.04676	0	0	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Energetic	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0	0.01824	0	0.0094	0.00526	0.0329	0	0	0
TOTAL (lb, non-embedded)	**0**	**0**	**0.01824**	**0**	**0.0094**	**0.00526**	**0.0329**	**0**	**0**	**0**

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. No distinction between different chromium valences (e.g., identification of hexavalent chrome) can be made from the available information.

TABLE 2-B-1
Metals in Munitions (Metals with Feed Rate Limitations - Module V)

Metals (lb)	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ag	Tl
155 MM Projectile (M104 and M110), Agent H, Surface Area = 2.9 sq. ft.										
Metals in Munition Metal (embedded)	0	0	0	0	0	0.21698	0	0	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Energetic (burster)	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0	0.02813	0	0.0145	0.00812	0.05075	0	0	0
TOTAL (lb, non-embedded)	**0**	**0**	**0.02813**	**0**	**0.0145**	**0.00812**	**0.05075**	**0**	**0**	**0**
155 MM Projectile (M121/A1 And M122), Agent GB, Surface Area = 2.9 sq. ft.										
Metals in Munition Metal (embedded)	0	0	0	0	0	3.6	0	0	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Energetic	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0	0.02813	0	0.0145	0.00812	0.05075	0	0	0
TOTAL (lb, non-embedded)	**0**	**0**	**0.02813**	**0**	**0.0145**	**0.00812**	**0.05075**	**0**	**0**	**0**
155 MM Projectile (M121/A1), Agent VX, Surface Area = 2.9 sq. ft.										
Metals in Munition Metal (embedded)	0	0	0	0	0	3.6	0	0	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Energetic	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0	0.02813	0	0.0145	0.00812	0.05075	0	0	0
TOTAL (lb, non-embedded)	**0**	**0**	**0.02813**	**0**	**0.0145**	**0.00812**	**0.05075**	**0**	**0**	**0**

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. No distinction between different chromium valences (e.g., identification of hexavalent chrome) can be made from the available information.

TABLE 2-B-1
Metals in Munitions (Metals with Feed Rate Limitations - Module V)

Metals (lb)	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ag	Tl
Ton Containers, Agent HD, Surface Area = 65.75 sq. ft.										
Metals in Fusible Plugs	0	0	0	0	0	0	1.684	0	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0	0.63778	0	0.32875	0.1841	1.15062	0	0	0
TOTAL (lb, non-embedded)	**0**	**0**	**0.63778**	**0**	**0.32875**	**0.1841**	**2.83462**	**0**	**0**	**0**
Ton Containers, Agent GB, Surface Area = 65.75 sq. ft.										
Metals in Fusible Plugs	0	0	0	0	0	0	1.684	0	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0	0.63778	0	0.32875	0.1841	1.15062	0	0	0
TOTAL (lb, non-embedded)	**0**	**0**	**0.63778**	**0**	**0.32875**	**0.1841**	**2.83462**	**0**	**0**	**0**
Ton Containers, Agent VX, Surface Area = 65.75 sq. ft.										
Metals in Fusible Plugs	0	0	0	0	0	0	1.684	0	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0	0.63778	0	0.32875	0.1841	1.15062	0	0	0
TOTAL (lb, non-embedded)	**0**	**0**	**0.63778**	**0**	**0.32875**	**0.1841**	**2.83462**	**0**	**0**	**0**

1. The ton containers are constructed of carbon steel. Any metals associated with the steel are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. The fusible plugs associated with the ton containers melt at 108 ^{o}C. Therefore the associated metals are assumed to be non-embedded and are included in the above totals.
3. No distinction between different chromium valences (e.g., identification of hexavalent chrome) can be made from the available information.
4. Weight and composition of brass valve associated with ton containers is unknown and therefore is not included in the above values (embedded and would not affect totals).

TABLE 2-B-1
Metals in Munitions (Metals with Feed Rate Limitations - Module V)

Metals (lb)	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ag	Tl
105 MM Cartridge (M360), Agent GB, Surface Area = 2.8 sq. ft.										
Metals in Munition Metal including fuze (embedded)	0	0	0	0	0.00044	1.21681	0	0	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Energetic (burster)	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0	0.02721	0	0.01402	0.00785	0.04908	0	0	0
TOTAL (lb, non-embedded)	**0**	**0**	**0.02721**	**0**	**0.01402**	**0.00785**	**0.04908**	**0**	**0**	**0**
105 MM Projectile (M360), Agent GB, Surface Area = 2.8 sq. ft.										
Metals in Munition Metal (embedded)	0	0	0	0	0	1.2148	0	0	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0	0.02721	0	0.01402	0.00785	0.04908	0	0	0
TOTAL (lb, non-embedded)	**0**	**0**	**0.02721**	**0**	**0.01402**	**0.00785**	**0.04908**	**0**	**0**	**0**

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. No distinction between different chromium valences (e.g., identification of hexavalent chrome) can be made from the available information.
3. The primer, propelling charge, and cartridge case associated with the 105 MM Cartridge are not processed at the TOCDF and are therefore not included in the above totals.

TABLE 2-B-1
Metals in Munitions (Metals with Feed Rate Limitations - Module V)

Metals (lb)	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ag	Tl
115 MM Rocket (M55), Agent GB, Surface Area = 7.93 sq. ft.										
Metals in Munition Metal (embedded)	0	0	0	0	0.000439	0.00201	0	0	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Energetic	0.000005	0	0.000005	0	0	0	0.1032	0	0	0
Metals in Paint	0	0	0.07692	0	0.03965	0.02220	0.1388	0	0	0
TOTAL (lb, non-embedded)	**0.000005**	**0**	**0.076925**	**0**	**0.03965**	**0.02220**	**0.2420**	**0**	**0**	**0**
115 MM Rocket Warhead (M56), Agent GB, Surface Area = 2.6 sq. ft.										
Metals in Munition Metal (embedded)	0	0	0	0	0.000439	0.00201	0	0	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Energetic	0.000005	0	0.000005	0	0	0	0.00021	0	0	0
Metals in Paint	0	0	0.02564	0	0.01322	0.00740	0.04626	0	0	0
TOTAL (lb, non-embedded)	**0.000005**	**0**	**0.025645**	**0**	**0.01322**	**0.00740**	**0.04647**	**0**	**0**	**0**

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. One third of the M55 Rocket surface area is assumed to be associated with the warhead for the calculation of the warhead surface area.
3. No distinction between different chromium valences (e.g., identification of hexavalent chrome) can be made from the available information.
4. The rocket warhead is constructed of an aluminum casing (95% Al, 5% Cu). The casing is assumed to weigh 10.8 lbs for the above calculations.

TABLE 2-B-1
Metals in Munitions (Metals with Feed Rate Limitations - Module V)

Metals (lb)	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ag	Tl
115 MM Rocket (M55), Agent VX, Surface Area = 7.93 sq. ft.										
Metals in Munition Metal (embedded)	0	0	0	0	0.000439	0.00201	0	0	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Energetic	0.000005	0	0.000005	0	0	0	0.1032	0	0	0
Metals in Paint	0	0	0.07692	0	0.03965	0.02220	0.1388	0	0	0
TOTAL (lb, non-embedded)	**0.000005**	**0**	**0.076926**	**0**	**0.03965**	**0.02220**	**0.2420**	**0**	**0**	**0**
115 MM Rocket Warhead (M56), Agent VX, Surface Area = 2.6 sq. ft.										
Metals in Munition Metal (embedded)	0	0	0	0	0.000439	0.00201	0	0	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Energetic	0.000005	0	0.000005	0	0	0	0.00021	0	0	0
Metals in Paint	0	0	0.02564	0	0.01322	0.00740	0.04626	0	0	0
TOTAL (lb, non-embedded)	**0.000005**	**0**	**0.02564**	**0**	**0.01322**	**0.00740**	**0.04647**	**0**	**0**	**0**

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. One third of the M55 Rocket surface area is assumed to be associated with the warhead for the calculation of the warhead surface area.
3. No distinction between different chromium valences (e.g., identification of hexavalent chrome) can be made from the available information.
4. The rocket warhead is constructed of an aluminum casing (95% Al, 5% Cu). The casing is assumed to weigh 10.8 lbs for the above calculations.

TABLE 2-B-1
Metals in Munitions (Metals with Feed Rate Limitations - Module V)

Metals (lb)	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ag	Tl
Weteye Bomb (MK-116), Agent GB, Surface Area = 28.4 sq. ft.										
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0	0.27553	0	0.14203	0.07953	0.49709	0	0	0
TOTAL (lb, non-embedded)	**0**	**0**	**0.27553**	**0**	**0.14203**	**0.07953**	**0.49709**	**0**	**0**	**0**
750 lb Bomb (MC-1), Agent GB, Surface Area = 17.5 sq. ft.										
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0	0.16930	0	0.08727	0.04887	0.30543	0	0	0
TOTAL (lb, non-embedded)	**0**	**0**	**0.16930**	**0**	**0.08727**	**0.04887**	**0.30543**	**0**	**0**	**0**

1. The metals within the munitions metal are unknown, not estimated, and considered to be embedded and are not included in the above totals.
2. No distinction between different chromium valences (e.g., identification of hexavalent chrome) can be made from the available information.

TABLE 2-B-1
Metals in Munitions (Metals with Feed Rate Limitations - Module V)

Metals (lb)	Sb	As	Ba	Be	Cd	Cr	Pb	Hg	Ag	Tl
8" Projectile (M426), Agent VX, Surface Area = 6.1 sq. ft.										
Metals in Munition Metal (embedded)	0	0	0	0	0	7.26	0	0	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Energetic	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0	0.05942	0	0.03063	0.01715	0.10721	0	0	0
TOTAL (lb, non-embedded)	**0**	**0**	**0.05942**	**0**	**0.03063**	**0.01715**	**0.10721**	**0**	**0**	**0**
Mine (M23), Agent VX, Surface Area = 3.5 sq. ft.										
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Energetic	0.00003	0	0	0	0	0	0.00044	0	0	0
Metals in Paint	0	0	0.03357	0	0.01730	0.00969	0.06056	0	0	0
TOTAL (lb, non-embedded)	**0.00003**	**0**	**0.03357**	**0**	**0.01730**	**0.00969**	**0.06100**	**0**	**0**	**0**
Spray Tank (TMU-28), Agent VX, Surface Area = 91.1 sq. ft.										
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0	0.88325	0	0.45529	0.25496	1.59350	0	0	0
TOTAL (lb, non-embedded)	**0**	**0**	**0.88325**	**0**	**0.45529**	**0.25496**	**1.59350**	**0**	**0**	**0**

1. The metals within the mine and spray tank metal are unknown, not estimated, and considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. No distinction between different chromium valences (e.g., identification of hexavalent chrome) can be made from the available information.

TABLE 2-B-2
Metals in Munitions (Other Metals of Interest)

Metals (lb)	Se	Ni	V	Al	B	Co	Cu	Mn	Sn	Zn
4.2" Cartridge (M2), Agent HT, Surface Area = 1.88 sq. ft.										
Metals in Munition Metal (embedded)	0	0.0895	0	0	0	0	0	0.1253	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Energetic	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0.0094	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.0094**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4.2" Cartridge (M2A1), Agent HD, Surface Area = 1.88 sq. ft.										
Metals in Munition Metal (embedded)	0	0.0895	0	0	0	0	0	0.1253	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Energetic	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0.0094	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.0094**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.

TABLE 2-B-2
Metals in Munitions (Other Metals of Interest)

Metals (lb)	**Se**	**Ni**	**V**	**Al**	**B**	**Co**	**Cu**	**Mn**	**Sn**	Zn
155 MM Projectile (M104 and M110), Agent H, Surface Area = 2.9 sq. ft.										
Metals in Munition Metal (embedded)	0	0.43395	0	0	0	0	0	0.60753	0	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Energetic (burster)	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0.0145	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.0145**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
155 MM Projectile (M121/A1 And M122), Agent GB, Surface Area = 2.9 sq. ft.										
Metals in Munition Metal (embedded)	0	0.45	0	0	0	0	0.45	0.495	0	0
Metals in Agent	0	0.00016	0	0.013	0	0	0.00003	0	0	0
Metals in Energetic	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0.0145	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.01466**	**0**	**0.013**	**0**	**0**	**0.00003**	**0**	**0**	**0**
155 MM Projectile (M121/A1), Agent VX, Surface Area = 2.9 sq. ft.										
Metals in Munition Metal (embedded)	0	0.45	0	0	0	0	0.45	0.495	0	0
Metals in Agent	0	0.00016	0	0.00063	0	0	0.00003	0	0	0
Metals in Energetic	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0.0145	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.01466**	**0**	**0.00063**	**0**	**0**	**0.00003**	**0**	**0**	**0**

1 The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.

TABLE 2-B-2
Metals in Munitions (Other Metals of Interest)

Metals (lb)	Se	Ni	V	Al	B	Co	Cu	Mn	Sn	Zn
Ton Containers, Agent HD, Surface Area = 65.75 sq. ft.										
Metals in Fusible Plugs	0	0	0	0	0	0	0	0	0.632	0
Metals in Agent	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0.32875	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.32875**	**0**	**0**	**0**	**0**	**0**	**0**	**0.632**	**0**
Ton Containers, Agent GB, Surface Area = 65.75 sq. ft.										
Metals in Fusible Plugs	0	0	0	0	0	0	0	0	0.632	0
Metals in Agent	0	0.0375	0	3.0	0	0	0.006	0	0	0
Metals in Paint	0	0.32875	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.36625**	**0**	**3.0**	**0**	**0**	**0.006**	**0**	**0.632**	**0**
Ton Containers, Agent VX, Surface Area = 65.75 sq. ft.										
Metals in Fusible Plugs	0	0	0	0	0	0	0	0	0.632	0
Metals in Agent	0	0.04	0	0.15	0	0	0.0064	0	0	0
Metals in Paint	0	0.32875	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.36875**	**0**	**0.15**	**0**	**0**	**0.0064**	**0**	**0.632**	**0**

1. The ton containers are constructed of carbon steel. Any metals associated with the steel are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. The fusible plugs associated with the ton containers melt at 108 °C. Therefore the associated metals are assumed to be non-embedded and are included in the above totals.
3. Weight and composition of brass valve associated with ton containers is unknown and therefore is not included in the above values (embedded and would not affect totals).

TABLE 2-B-2
Metals in Munitions (Other Metals of Interest)

Metals (lb)	Se	Ni	V	Al	B	Co	Cu	Mn	Sn	Zn
105 MM Cartridge (M360), Agent GB, Surface Area = 2.8 sq. ft.										
Metals in Munition Metal including fuze (embedded)	0	0.15185	0	0	0	0	0.15185	0.16703	0	0
Metals in Agent	0	0.00004	0	0.00326	0	0	0.000006	0	0	0
Metals in Energetic (burster)	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0.01402	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.01406**	**0**	**0.00326**	**0**	**0**	**0.000006**	**0**	**0**	**0**
105 MM Projectile (M360), Agent GB, Surface Area = 2.8 sq. ft.										
Metals in Munition Metal (embedded)	0	0.15185	0	0	0	0	0.15185	0.16703	0	0
Metals in Agent	0	0.00004	0	0.00326	0	0	0.000006	0	0	0
Metals in Paint	0	0.01402	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.01406**	**0**	**0.00326**	**0**	**0**	**0.000006**	**0**	**0**	**0**

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. The primer, propelling charge, and cartridge case associated with the 105 MM Cartridge are not processed at the TOCDF and are therefore not included in the above totals.

TABLE 2-B-2
Metals in Munitions (Other Metals of Interest)

Metals (lb)	Se	Ni	V	Al	B	Co	Cu	Mn	Sn	Zn
115 MM Rocket (M55), Agent GB, Surface Area = 7.93 sq. ft.										
Metals in Munition Metal (embedded)	0	0	0	10.26	0	0	0.54	0	0	0
Metals in Agent	0	0.00027	0	0.0214	0	0	0.00004	0	0	0
Metals in Energetic	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0.03965	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.03992**	**0**	**0.0214**	**0**	**0**	**0.00004**	**0**	**0**	**0**
115 MM Rocket Warhead (M56), Agent GB, Surface Area = 2.6 sq. ft.										
Metals in Munition Metal (embedded)	0	0	0	10.26	0	0	0.54	0	0	0
Metals in Agent	0	0.00027	0	0.0214	0	0	0.00004	0	0	0
Metals in Energetic	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0.01322	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.01349**	**0**	**0.0214**	**0**	**0**	**0.00004**	**0**	**0**	**0**

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. One third of the M55 Rocket surface area is assumed to be associated with the warhead for the calculation of the warhead surface area.
3. The rocket warhead is constructed of an aluminum casing (95% Al, 5% Cu). The casing is assumed to weigh 10.8 lbs for the above calculations.

TABLE 2-B-2
Metals in Munitions (Other Metals of Interest)

Metals (lb)	Se	Ni	V	Al	B	Co	Cu	Mn	Sn	Zn
115 MM Rocket (M55), Agent VX, Surface Area = 7.93 sq. ft.										
Metals in Munition Metal (embedded)	0	0	0	10.26	0	0	0.54	0	0	0
Metals in Agent	0	0.00025	0	0.001	0	0	0.00004	0	0	0
Metals in Energetic	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0.03965	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.0399**	**0**	**0.001**	**0**	**0**	**0.00004**	**0**	**0**	**0**
115 MM Rocket Warhead (M56), Agent VX, Surface Area = 2.6 sq. ft.										
Metals in Munition Metal (embedded)	0	0	0	10.26	0	0	0.54	0	0	0
Metals in Agent	0	0.00025	0	0.001	0	0	0.00004	0	0	0
Metals in Energetic	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0.01322	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.01347**	**0**	**0.001**	**0**	**0**	**0.00004**	**0**	**0**	**0**

1. The metals within the munitions metal are considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.
2. One third of the M55 Rocket surface area is assumed to be associated with the warhead for the calculation of the warhead surface area.
3. The rocket warhead is constructed of an aluminum casing (95% Al, 5% Cu). The casing is assumed to weigh 10.8 lbs for the above calculations.

TABLE 2-B-2
Metals in Munitions (Other Metals of Interest)

Metals (lb)	Se	Ni	V	Al	B	Co	Cu	Mn	Sn	Zn
Weteye Bomb (MK-116), Agent GB, Surface Area = 28.4 sq. ft.										
Metals in Agent	0	0.00868	0	0.694	0	0	0.00139	0	0	0
Metals in Paint	0	0.14203	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.15071**	**0**	**0.694**	**0**	**0**	**0.00139**	**0**	**0**	**0**
750 lb Bomb (MC-1), Agent GB, Surface Area = 17.5 sq. ft.										
Metals in Agent	0	0.0055	0	0.44	0	0	0.00088	0	0	0
Metals in Paint	0	0.08727	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.09277**	**0**	**0.44**	**0**	**0**	**0.00088**	**0**	**0**	**0**

1. The metals within the munitions metal are unknown, not estimated, and considered to be embedded and are not included in the above totals.

TABLE 2-B-2
Metals in Munitions (Other Metals of Interest)

Metals (lb)	Se	Ni	V	Al	B	Co	Cu	Mn	Sn	Zn
8" Projectile (M426), Agent VX, Surface Area = 6.1 sq. ft.										
Metals in Munition Metal (embedded)	0	0.9075	0	0	0	0	0.9075	0.9983	0	0
Metals in Agent	0	0.00036	0	0.00145	0	0	0.00006	0	0	0
Metals in Energetic	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0.03063	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.03099**	**0**	**0.00145**	**0**	**0**	**0.00006**	**0**	**0**	**0**
Mine (M23), Agent VX, Surface Area = 3.5 sq. ft.										
Metals in Agent	0	0.00026	0	0.00105	0	0	0.00004	0	0	0
Metals in Energetic	0	0	0	0	0	0	0	0	0	0
Metals in Paint	0	0.01730	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.01756**	**0**	**0.00105**	**0**	**0**	**0.00004**	**0**	**0**	**0**
Spray Tank (TMU-28), Agent VX, Surface Area = 91.1 sq. ft.										
Metals in Agent	0	0.03390	0	0.1356	0	0	0.00542	0	0	0
Metals in Paint	0	0.45529	0	0	0	0	0	0	0	0
TOTAL (lb, non-embedded)	**0**	**0.48919**	**0**	**0.1356**	**0**	**0**	**0.00542**	**0**	**0**	**0**

1. The metals within the mine and spray tank metal are unknown, not estimated, and considered to be fixed (embedded, inert) and will not vaporize and are therefore not included in the above totals.

Table 2-C-1
ENERGETIC/AGENT NOMINAL WEIGHT
FOR
CHEMICAL AGENT MUNITIONS/BULK CONTAINERS

MUNITION	MODEL / AGENT	DIMENSIONS			AGENT		BURSTER			PROPELLANT		FUSE MODEL	OTHER ENERGETIC COMPONENTS
		DIAMETER	LENGTH (INCHES)	WEIGHT (LBS)	TYPE	WEIGHT (LBS)	MODEL	EXPLOSIVE	WEIGHT (LBS)	MODEL	WEIGHT (LBS)		
105-mm Cartridge	M360	105 mm	31.1	43.86	GB	1.63	M40	Tetrytol	1.12	-	-	M508	M28B2 Primer
							M40A	Comp B					
							NA	NA				M557	NA
105-mm Projectile	M360	105 mm	31.1	NA	GB	1.63	--	--	--	--	--	0	--
4.2-inch Mortar	M2	4.2 inch	21.0	24.67	HD	6.0	M14	Tetryl	0.14	-	-	M8	M2 Primer
				24.47	HT	5.8							
155-mm Projectile	M104	155 mm	26.8	98.9	H	11.7	M6	Tetrytol	0.41	--	--	--	--
	M110												
	M121				GB	6.5	--	--	--				
	M121A1				VX	6.3	M71	Comp B	2.45				
					GB	6.5							
	M122				GB	6.5	M37	Tetrytol					
8-inch Projectile	M426	8 inch	35.1	203	VX	14.5	M83	Comp B	7.0	--	--	--	--
					GB		M83	Comp B					
					GB		NA	NA					
Land Mine	M23	13.5	5	23	VX	10.5	M38	Comp B	0.8	--	-	M603	--
Rocket	M55	115 mm	78.0	57	GB	10.7	M34	Comp B	3.2	M28	19.3	M417	M62 Primer
							M36						
					VX	10.0	M34			M67			
							M36						
525 lb Weteye Bomb	MK-116-0	14	84	525	GB	347	--	--	--	--	--	--	--
750 lb Bomb	MC-1	16.0	50.0	725	GB	220	--	--	--	--	--	--	--
Spray Tank	TMU-28/B	22.5	185.5	1,935	VX	1,356	--	--	--	--	--	--	--
Ton Containers	Agent GB	30.1	85.1	2,900	GB	1,500	--	--	--	--	--	--	--
	Agent HD			3,100	HD	1,700							
	Agent VX			3,000	VX	1,600							

NOTES:
NA = Information not available; HD, and HT = Mustard
RDX = cyclotrimethylenetrinitramine; $N(NO_2)CH_2N(NO_2)CH_2N(NO)_2CH_2$
Composition B = 60% RDX, 39% TNT, 1% presensitizer (wax)
TNT = 2,4,6-trinitrotoluene; $CH_3C_6H_2(NO_2)_3$
Tetryl = 2,4,6-trinitrophenylmethylnitramine; $(NO_2)_3C_6H_2N(N)_2)CH_3$

Table 2-C-2
COMPOSITION OF REACTIVE MATERIAL IN MUNITIONS

MUNITION	COMPONENT			WEIGHT	COMPOSITION
M55 Rocket	1.	Fuze, M417			
		a.	Booster	1.12 grains	RDX[a]
		b.	Pellet Booster	183.5 grains	RDX[a]
		c.	Rotor, Lead	2.77 grains	RDX[a]
	2.	Detonator, M63			
		a.	Upper Charge Primer Mix	0.31 grains	Overall Mixture:40% Lead Styphnate20% Lead Azide20%Barium Nitrate15%Antimony Sulfide5% Tetracene
		b.	Intermediate Charge	2.0 grains	Lead Azide
		c.	Lower Charge	0.99 grains	RDX[a]
	3.	Squib, M2			
		a.	Flash Charge	1.0 grains each(2 required)	Overall Mixture:32% Lead Thiocyanate40% Potassium Chlorate18% Charcoal10% Egyptian Lacquer
		b.	Booster Igniter	46.2 grains(2 required)	Overall Mixture:49% Magnesium49% Potassium Perchlorate2% Cellulose Nitrate-Camphor
	4.	Igniter Rocket Motor, M62		385 grains	Overall Mixture:49% Magnesium49% Potassium Perchlorate2% Cellulose Nitrate-Camphor
	5.	Propellant Grain, M28		134,750 grains	Overall Mixture:60.0% Nitrocellulose23.8% Nitroglycerin9.9% Triacetin2.6% Diethylphthalate2.0% Lead Stearate1.7% 2-Nitrodiphenylamine
	6.	Rocket Burster, M34		22,400 grains	Composition B[b]
	7.	Rocket Burster, M36		--	Composition B[b]
	8.	Rocket Motor Pellet		3.1 grains	Overall Mixture:49% Magnesium49% Potassium Perchlorate2% Cellulose Nitrate-Camphor
M23 Land Mine	1.	Fuze, M603			
		a.	Detonator, M45		
			(1)	1.4 grains	Overall Mixture: 53% Potassium Chlorate25% Lead Thiocyanate17% Antimony Sulfide5% Lead Azide
			(2)	3.9 grains	Lead Azide
			(3)	1.9 grains	RDX[a]
	2	Booster, M120		169.8 grains	RDX[a]
	3.	Burster, M38		5710 grains	Composition B
				47 grains	Tetryl
	4.	Initiator, M48		848.8 grains	Composition B
	5	Activator, M1		46.3 grains	8% Lead Azide, 87% Tetryl, 5% Igniter Mix
M360	1.	Fuze, M508A1			
		a.	Booster	230 mg	Lead Azide
				244 mg	Tetryl Lead
		b.	Booster Pellet	22 grams	Tetryl[d]
	2.	Detonator, M18			
		a.	Upper Charge	65 mg	Overall Mixture:33.5% Potassium Chlorate32.2% Antimony Sulfide28.3% Lead Azide5.0% Carborundum
		b.	Intermediate Charge	191 mg	Lead Azide
		c.	Lower Charge	80 mg	Tetryl[d]
M2A1(4.2-inch mortar)	1.	Fuze, M8			
		a.	Booster Charge	65.2 grams	Tetryl[d]
	2.	Detonator, M18			
		a.	Upper Charge	50 mg	Overall Mixture:33.5% Potassium Chlorate32.2% Antimony Sulfide28.3% Lead Azide5.0% Carborundum
		b.	Intermediate Charge	157 mg	Lead Azide

Table 2-C-2
COMPOSITION OF REACTIVE MATERIAL IN MUNITIONS

MUNITION	COMPONENT				WEIGHT	COMPOSITION
		c.	Lower Charge		70 mg	Tetryl[d]
M60	1.	Fuze, M51A5				
		a.	Booster, M121A4		230 mg	Lead Azide
					244 mg	Tetryl Lead
		b.	Booster Charge		22 grams	Tetryl[d]
	2.	Detonator, M24				
		a.	Upper Charge		68 mg	Overall Mixture:33.5% Potassium Chlorate32.2% Antimony Sulfide28.3% Lead Azide5.0% Carborundum
		b.	Lower Charge		185 mg	Tetryl[d]
		c.	Plunger, M1			
			(1)	Primer, M54	11 mg	Overall Mixture:53% Potassium Chloride25% Lead Sulfocyanate17% Antimony Sulfide5% TNT[c]
			(2)	Black Powder	19 mg	Black Powder
			(3)	Relay	100 mg	Lead Azide

[a] RDX = cyclotrimethylenetrinitramine; $N(NO_2)CH_2N(NO_2)CH_2N(NO)_2CH_2$)
[b] Composition B = 60% RDX, 39% TNT, 1% presensitizer (wax)
[c] TNT = 2,4,6-trinitrotoluene; $CH_3C_cH_2(NO_2)_3$
[d] Tetryl = 2,4,6-trinitrophenylmethylnitramine; $(NO_2)_3C_6H_2N(N)_2)CH_3$

QUALITY ASSURANCE PROJECT PLAN
For
TOCDF WASTE ANALYSIS

Table of Contents

Table of Contents
(Continued)

DISTRIBUTION LIST

Distribution within TOCDF will be in accordance with the current controlled documents list maintained by EG&G Document Control. As a minimum this will include:

EG&G Quality Compliance Manager
Battelle QA/QC Manager
Battelle Analytical/Branch Manager
Battelle Project Manager
EG&G Operations Manager

1.0 PROJECT/TASK ORGANIZATION

EG&G Defense Materials Inc., (EG&G) is responsible for the operations of the Tooele Chemical Demilitarization Facility (TOCDF). It is organized to provide for the efficient coordination of the performance of Waste Sampling and Analysis. Within EG&G there are several groups which may request samples (i.e., Environmental, Laboratory, Operations, etc.) All sample and analysis requests are then coordinated through the Control Room in accordance with established procedures. The Environmental and Quality Compliance groups provide the independent oversight of all waste sampling and analysis activities.

Battelle, a subcontractor to EG&G, is responsible to perform all sampling actions and most analysis. The Battelle Monitoring Branch performs the sampling actions, while the Battelle Analytical Branch performs the analysis. The QC branch within Battelle performs oversight of the sampling and analytical activities. The Laboratory QC Branch reports operationally to the EG&G Quality Compliance Manager.

Subcontract laboratories may be utilized for analyses, which Battelle cannot perform. These laboratories will be under subcontract to EG&G, but Battelle Management may be delegated the responsibility to perform the duties of the EG&G Contract Authorized Representative. Subcontract laboratories will be evaluated and approved by EG&G Quality Compliance organization utilizing Battelle QC personnel as appropriate. All subcontracted laboratories will have current Utah State certifications for applicable analysis.

EG&G and Battelle will maintain approved organization charts.

NOTE; Organizations may be altered as workloads, equipment and methodologies change.

2.0 PROBLEM DEFINITION/BACKGROUND

The Waste Analysis Plan provides the details of both the problem definition and the project background.

3.0 PROJECT/TASK DESCRIPTION

The Waste Analysis Plan provides details of the project tasks. Included are the measurements to be performed, approaches and methods. The Waste Analysis Plan in conjunction with the Laboratory Quality Control Plan provides the quality standards, criteria, objectives, and equipment requirements for this project.

Assessments of the project will be scheduled, and performed by EG&G utilizing the EG&G audit and surveillance program along with detailed documentation, procedural, and operational surveillances performed by Battelle QC personnel.

Work Schedules are developed and implemented by the EG&G Project Controls organization. These schedules are continuously updated to reflect current actions and activities.

Project and quality records and reports are identified within the project documents (i.e., RCRA Permit, Project Regulatory Procedures, Laboratory Operating Procedures, Standard

Operating Procedures etc.) Included are records such as: Calibration Data Sheets, QC Laboratory Data, Audit Records, Training Records, etc.

4.0 DATA QUALITY OBJECTIVES FOR MEASUREMENT

The data quality objectives for measurement are found within the Waste Analysis Plan for sample results. Precision and accuracy requirements for QC samples are listed in the Laboratory Quality Control Plan, LOPs, and each applicable EPA approved analytical method.

5.0 PROJECT NARRATIVE

The data generated from analyzing the chemical munitions and bulk containers of chemical agent will be utilized to ensure proper management and treatment in accordance with TOCDF permits. Data generated from analyzing the wastes resulting from the treatment of chemical munitions and bulk containers will be used to ensure management, treatment and disposal is in accordance with the TOCDF RCRA Permit and applicable federal and state regulations.

When the analytical results are obtained in accordance with established procedures and the data has been validated, the waste analysis will be considered successful.

Throughout the overall program, EPA approved sampling protocols will be utilized. All sampling will be performed in accordance with the Waste Analysis Plan, and TOCDF laboratory procedures.

Sample types are predetermined in accordance with the TOCDF Waste Analysis Plan. Sample locations are predetermined and incorporated into the facility design. (Additional sample location information is found in the RCRA Permit and the Waste Analysis Plan.)

Sample handling and custody requirements are delineated in the Laboratory Quality Control Plan, Project Regulatory Procedures and Laboratory Operating Procedures. EPA-approved sample protocols were utilized as a basis for procedure development.

Sampling instrumentation will be selected based upon sample matrix, sample type, and type of container requiring sampling. Sampling equipment will be cleaned in accordance with Laboratory Operating Procedures prior to use. As a minimum, reinstate blanks will be taken once every twenty times a piece of sampling equipment is used. For disposable sampling equipment the vendor will provide a certificate of analysis verifying the equipment to be free of possible contaminants. Sampling equipment does not require calibration.

Analysis will be in accordance with EPA-approved methodologies. When EPA has no approved methodology, laboratory approved procedures will be utilized to perform the analysis. Selection of parameters to be evaluated was based upon data complied from previous government analysis of the wastes to be treated. Selections of the methods are based upon the sample matrix and the analytical results required evaluating the waste streams.

Analytical instrumentation used by Battelle will be calibrated in accordance with the requirements of the LQCP. Three different types of performance evaluation samples are

used at TOCDF, QLs, QPs, and Blind QLs. The preparation, use and evaluation of these samples will be in accordance with the requirements of the LQCP.

Agent analysis is performed using a variety of instrumentation. Most commonly a Gas Chromatograph (GC) equipped with a flame photometric detector (GC-FPD) will be used. Current methods also used include a GC equipped with both an FPD and a Mass Selective Detector (GC-FPD/MSD) for mass spectrometry methods and a GC equipped with a flame ionization detector (GC-FID) for determining agent purity. Explosive analysis will be performed on a GC equipped with a electron capture detector (GC-ECD). EPA approved analytical methods give detailed instructions on the calibration and use of quality control samples. Each method outlines the precision and accuracy criteria to be used in evaluating quality control samples.

For EPA approved analysis, analytical instrumentation will be in accordance with the applicable EPA approved analytical method.

Prior to TOCDF operations, the government will perform Pre-Operational Readiness Evaluations. Included within are evaluations of sampling and analysis programs and Battelle Laboratory analytical operations. All subcontracted laboratories utilized will be evaluated for capabilities by EG&G Quality Compliance or Battelle QC as appropriates. These evaluations will be performed prior to and will be the basis for subcontract award. Oversight of waste analysis will be performed by EG&G Quality Compliance, EG&G Environmental Compliance, and Battelle QC. The oversight will be in the form of surveillances, system audits, and performance audits. These will be in accordance with approved TOCDF procedures.

6.0 SPECIAL TRAINING REQUIREMENTS/CERTIFICATIONS

Due to the nature of the TOCDF, there are special training and certification requirements. As a result, the TOCDF has established a training department. On file within this department are preestablished training and certification requirements for each job position at the TOCDF.

7.0 DOCUMENTATION AND RECORDS

Documentation and records of all sampling and analysis activities will be generated and maintained. Included will be sample collection records, field logs, sample analysis records, analytical result reports, chain of custody forms etc.

Individual documents are identified as records within the TOCDF procedures. All records will be transmitted to the EG&G Document Control department for final storage. Records will be stored and retained in accordance with the TOCDF Document Data Management Plan.

All Analytical data, chain-of-custody documentation, sample collection information, and off-site laboratory results will be stored in the Daily Data Package in accordance with the LQCP.

8.0 SAMPLE METHOD, HANDLING AND CUSTODY REQUIREMENTS

This section describes the procedures, which will be followed during the field-sampling program. Throughout the overall program, EPA-approved sampling protocols will be utilized.

Personnel are requesting hazardous waste samples will initiate a Sample/Analysis Management Form in accordance with PRP-OP-021 (Sample and Analysis Requests). The Sample/Analysis Management Form will be reviewed and approved by TOCDF Environmental.

Management personnel, Battelle Monitoring Branch personnel will collect samples. TOCDF Laboratory Operating Procedures (LOPs) TE-LOP-534 and TE-LOP-535 (Liquid Residue Sampling and Dry Solid Residue Sampling respectively) give detailed directions for collecting all hazardous waste samples at TOCDF. This LOPs incorporates the requirements of SW-846, Chapter 1, Field Quality Control and give specific guidance for the following:

- Sampling plans to ensure representative samples are collected and detailed instructions are given on how to take split samples for agent/explosive related hazardous wastes.

- Sample volume, container and preservative for each type of sample collected.

- Frequency of Quality Control Samples (i.e., duplicates, field blanks, trip blanks, method blanks, reinstate blanks, matrix spikes, etc.).

- Performance of sampling procedures will be surveilled on a random basis by Battelle QC Branch personnel in accordance with TE-LOP-592 (QC Procedures for Monitoring Operations).

Every sample that has the potential to be contaminated with Chemical Warfare Agents VX, GB, or H as listed in the Waste Analysis Plan (WAP) will be agent screened by Battelle Laboratory Analytical Branch personnel before being released to an off-site laboratory for analysis. This agent screen will be accomplished by analyzing one sample from a split sample. It is the responsibility of the Sample Requestor to ensure the **Agent Related** box on the Sample/Analysis Management form is checked for any sample requiring an agent screen. Likewise, all hazardous waste samples requiring an explosive screen (as listed in the WAP) will have split samples collected and an explosive screen performed by Battelle Laboratory Analytical Branch personnel before being released to an off-site laboratory for analysis. Chain-of-Custody will be maintained by recording the name, date, and time of any transfer of the sample to another person or to a secure, locked area from the inception of the sample through analysis. Samples will be delivered to the TOCDF Chemical Assessment Laboratory (CAL) and logged by a Sample Custodian. The Battelle Data Management Group will track samples by the Sample Collection Record number, which corresponds to the date the sample, was collected. The TOCDF Sample Custodian will be responsible for ensuring no sample goes off-site prior to being screened for agent or explosives, if required. TE-LOP-597 (Data Management Operations) gives detailed procedures on the receipt, storage, holding times, log-in, and tracking of samples.

9.0 ANALYTICAL METHOD REQUIREMENTS

Analytical methods are identified in appendices of the Waste Analysis Plan. All sample analysis performed at the TOCDF CAL will be conducted in accordance with EPA approved

analytical methods and/or approved site-specific analytical methods as applicable. The TOCDF CAL will perform the required agent and explosive screen as well as maintain certification with the State of Utah to conduct pH and free liquid analyses.

Quality Control Samples will be analyzed in accordance with the requirements of the TOCDF LQCP. TE-LOP-572 (Extractions/Analyses) addresses the procedures for performing the extraction analysis for agent and explosives. TE-LOP-574 (Special Analyses) addresses the site-specific procedures for performing the pH and free liquid analyses. These procedures address the calibration and quality control requirements of the TOCDF LQCP and the applicable EPA approved analytical methods.

All sample analysis performed by the off-site laboratory will be in accordance with the applicable EPA approved analytical methods. The off-site laboratory will have an internal Quality Assurance Plan that details how they will meet the quality control requirements outlined in each EPA approved analytical method as well as internal operating procedures for each analysis. The Quality Assurance Plan and the operating procedures will be reviewed by an EG&G representative annually to ensure they meet all requirements. The off-site laboratory will maintain State of Utah certification to conduct all analyses required by TOCDF.

10.0 QUALITY CONTROL REQUIREMENTS

The TOCDF Chemical Assessment Laborarory (CAL) will use an assortment of Quality Control Laboratory Samples (QLs), Quality Control Plant Samples (QPs), and Blind QLs as outlined in the LQCP to determine control status and systematic error in analytical methods. These samples will be analyzed at the frequency dictated by the LQCP and the results will be evaluated against the pass/fail criteria specified in the LQCP. Analytical results yielding out-of-control results will result in laboratory personnel taking corrective actions as specified in the LQCP and applicable laboratory operating procedures. Battelle Quality Control Personnel in accordance with TE-LOP-594 (QC Procedures will prepare Quality Control samples for Analytical Operations). Quality Control Personnel will also conduct procedure surveillances of the analytical and sample collection procedures on a random basis as directed in accordance with TE-LOP-594 (QC Procedures for Analytical Operations) and TE-LOP-592 (QC Procedures for Monitoring Operations).

Off-site contract laboratories will adhere to the quality control requirements specified in SW-846, Chapter 1, Section 1.2.2, Analytical Quality Control as well as quality control requirements specific to each analytical method. This includes quality control samples (duplicates, field blanks, trip blanks, method blanks, reinstate blanks, matrix spikes, etc.). The precision and accuracy requirements will be met for each sample analyzed by the off-site laboratory. The laboratory is also required to follow all quality control requirements listed in their Quality Assurance Plan. Off-site contract laboratories are selected based on their certification by the State of Utah, which requires yearly analysis of blind samples.

In addition, on a random basis, blind quality control samples will be generated by the Battelle Quality Control Branch and shipped to the off-site laboratory for analysis. This performance audit will add confidence to the analytical results generated by the off-site laboratory or to aid in the resolution of problems associated with laboratory contamination. The frequency of these performance audits will be at the discretion of the Battelle Quality Control Branch Chief.

11.0 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE REQUIREMENTS

As a minimum, preventive maintenance of analytical instrumentation will be performed in accordance with the maintenance procedures specified in the LOPs. All maintenance (corrective and preventive) will be thoroughly documented.

Analyzing quality control samples and evaluating the found results against the target results in accordance with LQPC requirements will perform instrument testing.

12.0 INSTRUMENT CALIBRATION AND FREQUENCY

Instruments will be calibrated, as needed, in accordance with the requirements of the LQCP or as specified in the EPA approved analytical method. Site specific laboratory operating procedures give specific procedures for calibrating analytical instruments.

13.0 INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES AND CONSUMABLES

Chemical reagents, solvents, sorbent tubes and V-to-G conversion pads are acceptance tested prior to use in accordance with requirements of the LQCP. Disposable sampling equipment and sample containers will be certified contaminate free by the vendor.

14.0 DATA MANAGEMENT

Data produced will be managed in accordance with the TOCDF Document Control Plan and the LQCP. Laboratory Data Management Requirements are listed in the LQCP and detailed procedures are specified in TE-LOP-597 and PRP-LA-006 for storage of hard copy results and magnetic media, respectively. Paperwork errors will be corrected using a single line through the incorrect entry, taking care to ensure the error is still legible. The person making the correction will annotate the correction with his/her initials, date and time of correction. Data integrity and security requirements are listed in the LQCP and procedures for ensuring these items are met are detailed in PRP-LA-006. Procedures to detect and correct losses to computer generated data during data reduction, data reporting, and data entries are in TE-LOP-597.

For the analyst will record analyses performed at the TOCDF CAL, raw data on worksheets in accordance with the applicable LOP and/or recorded directly by the Laboratory Information Management System (LIMS). Analytical results will be reported to the TOCDF Control Room and the Environmental Management Branch by the Shift Chemist on duty in accordance with applicable LOP. QC will inspect and verify data for accuracy and completeness in accordance with TE-LOP-594.

15.0 ASSESSMENT AND RESPONSE ACTIONS

EG&G will be utilizing several methods for assessments for the Waste Analysis program.

15.1 READINESS REVIEWS

Prior to the start of initial operations the government performs a pre-operational readiness evaluation. Included within the evaluation are the environmental and laboratory activities. The government identifies deficiencies in a report to the TOCDF. Each deficiency is classified as Category I, II, or III. Category I deficiencies are required to be corrected before agent operations, category II require correction, but not before agent operations, and category III are corrected during the pre-operation readiness evaluation.

15.2 PERFORMANCE AUDITS

Performance audits will be performed during the implementation of the waste analysis program. The TOCDF CAL will use an assortment of Quality Control Laboratory Samples (QLs), Quality Control Plant Samples (QPs), and Blind QLs as outlined in the LQCP to determine control status and systematic error in analytical methods. These samples will be analyzed at the frequency dictated by the LQCP. Battelle Quality Control Personnel in accordance with TE-LOP-594 (QC Procedures will prepare quality control samples for Analytical Operations). In addition, on a random basis, blind quality control samples will be generated by the Battelle Quality Control Branch and shipped to the off-site laboratory for analysis. This performance audit will add confidence to the analytical results generated by the off-site laboratory or to aid in the resolution of problems. The frequency of these performance audits will be at the discretion of the Battelle Quality Control Branch Chief.

15.3 SYSTEM AUDITS

System audits of EG&G and Battelle Laboratory activities will be scheduled and performed and documented in accordance with the EG&G Audit procedure (PRP-QA-18). Within this procedure the Audit Supervisor develops and issues annual audit schedules for the performance of TOCDF Audits. Performance of audits is under the direct supervision of a certified lead auditor. Audit teams consist of personnel who are independent of the work activity and may contain both QA and Technical personnel.

15.4 SURVEILLANCES

Waste management activities will be subject to ongoing surveillances during the life of the TOCDF. Surveillances will be performed by EG&G Quality Oversight Personnel in accordance with PRP-QA-19, and by Battelle QC personnel in accordance with TE-LOP-592 and TE-LOP-594.

In accordance with the TOCDF Quality Assurance Program Plan, annual evaluations of subcontract laboratories will be performed. Theses annual evaluations will be in the form of EG&G surveillance.

15.5 DEFICIENCY MANAGEMENT

Quality Deficiency Reports (DRs) are used to identify problem areas identified during EG&G or BATTELLE audits and surveillances. Each DR requires a response from the responsible party that gives proposed corrective action to remedy the problem as well as steps to be taken to ensure the problem does not re-occur. Final verification of corrective action and closure of the deficiency will be the responsibility of the initiating department. All Deficiency Reports are to be processed in accordance with PRP-QA-014 (Control of Nonconformances).

16.0 REPORTS TO MANAGEMENT

The waste analysis program is a support activity to the facility operations. As such, status of activities is a continual interaction between all organizations and at all levels of management.

The EG&G Quality Compliance Manager prepare monthly reports to management which include the following information with respect to the Waste Analysis Program:

- Results of audits and surveillances performed
- Results of data quality assessments
- Significant quality assurance problems and recommended solutions.

Reports will be distributed, as a minimum, to Environmental Permitting, Operations Support, Battelle Laboratories, Process Engineering, and Shift Managers.

17.0 DATA REVIEW, VALIDATION, AND VERIFICATION REQUIREMENTS AND METHODS

Data generated at the CAL will be reviewed for completeness, precision and accuracy by the on-duty Shift Chemist prior to submitting results to QC for review. QC will review the analytical results for precision and accuracy against the requirements of the LQCP, applicable LOP, and/or the applicable EPA approved analytical method.

Off-site analytical results will be validated in accordance with internal operating procedures by the off-site lab prior to sending results to TOCDF. After internal validation, the results will be forwarded to EG&G in a format determined by the contract with the laboratory. Battelle QC Branch personnel will evaluate the quality control data in accordance with TE-LOP-594 (QC Procedures for Analytical Operations) for the samples analyzed off-site. The quality control data will be evaluated against the precision and accuracy criteria required by the analytical method.